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AEROSPACE MEDICINE AND BIOLOGY

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

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NOVEMBER 1964

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INTRODUCTION

SP-7011 (04) is the fifth issue of *Aerospace Medicine and Biology*, NASA's continuing bibliography for the abstracting and announcement of current references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project (AMBBP) of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics, and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, SP-7011.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry in SP-7011 (04) consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

- a. NASA entries identified by their *STAR* accession numbers (N64-10000 series),
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AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography NOVEMBER 1964

STAR ENTRIES

N64-25842 Flying Personnel Research Committee (Gt. Brit.)

VISUAL PERCEPTION OF MOVEMENT

T. C. D. Whiteside (Inst. of Aviation Med., RAF) Air Ministry, 23 Aug. 1963 16 p refs. An Edridge Green Lecture Presented at the Roy. Coll. of Surgeons of Engl. See A64-80214

(FPRC/MEMO-191)

Human visual behavior is discussed generally, with special attention given to motion perception. It is suggested that the conclusions could be applied in the use of a stable observer's platform for the airborne avoidance of collisions, and to the design of space-vehicle rendezvous systems. D. E. W.

N64-25843 Flying Personnel Research Committee (Gt. Brit.)
A METHOD OF DETERMINING TRANSMISSION LOSSES IN A BICYCLE ERGOMETER

D. Denison and A. Jarrett (Inst. of Aviation Med., RAF) Air Ministry Jun 1963 5 p
(FPRC/MEMO-198)

A description is given of a method of determining transmission losses in a bicycle ergometer. The method is based on the physical principle that the work required to halt a moving body equals the kinetic energy of the body. For the rotating flywheel of a bicycle ergometer, the work of halting the wheel is equal to the kinetic energy of the wheel. The results obtained suggest that the method is satisfactory and simple. A value of transmission resistance representing about 10% of a light workload, and a variation in resistance with flywheel velocity that is equivalent to about 2% of a light workload are obtained. The practical conclusion is that 0.1 kg wt can be added to the observed brake-band tension in calculating the work done with the effect of velocity being ignored. I. v. L.

N64-25844 Flying Personnel Research Committee (Gt. Brit.)

CLOTHING FOR PROTECTION AGAINST COLD IN FLIGHT. II: A TRIAL OF ELECTRICALLY HEATED UNDERWEAR BY NAVIGATORS OF 85 SQUADRON, R.A.F. WEST RAYNHAM

J. D. Nelms (Inst. of Aviation Med., RAF) Air Ministry, May 1963 25 p refs
(FPRC/MEMO-200)

Electrically heated underwear, gloves, and socks were worn by 32 navigators for about 200 hours in Canberra T.11 and T.4 aircraft engaged in high-altitude winter flights. In all cases sufficient warmth was available, and a great increase in comfort was reported. Further modifications are needed to the gloves and main lead, and a compact voltage controller is required. The suit should be integrated with the immersion suit for maximum benefit. Author

N64-25845 Flying Personnel Research Committee (Gt. Brit.)

ASSESSMENT OF INTERIM SEAT MOUNTED OXYGEN SYSTEM FOR LIGHTNING MK. V (OP.7190)

P. R. Wagner (Inst. of Aviation Med., RAF) Air Ministry, Jul 1963 23 p refs
(FPRC/MEMO-202)

The oxygen system described consists of two separate seat-mounted demand systems, the outlets of which are fed into a common line immediately upstream of the personal equipment connector. The main regulator operates from the aircraft liquid oxygen system; the emergency or standby regulator operates from the emergency oxygen cylinder. The sample system is within the standards required except for the air mix characteristics. R.T.K.

N64-25846 Flying Personnel Research Committee (Gt. Brit.)

THE ELEVATOR ILLUSION

J. I. Niven, T. C. D. Whiteside (Inst. of Aviation Med., RAF), and A. Graybiel (Naval School of Aviation Med.) Air Ministry, Oct. 1963 17 p refs
(FPRC/1213)

Two normal and two labyrinthine defective subjects were exposed to vertical accelerations of either less than 1 g or more than 1 g on descent or ascent, respectively, in an elevator. Three targets were utilized: a real target alone, a visual afterimage alone, and a combination of both. In general, it was found that normal subjects tend to perceive illusory movement of real targets and visual afterimages during vertical acceleration greater and less than 1 g. Real target apparent movement is downward when $g < 1$ and upward when $g > 1$; for a visual afterimage the directional relationships are reversed. There is no well-defined Displacement of a real target whereas marked displacement occurs with a visual afterimage. When viewed in combination, the same relationships are maintained. For subjects lacking vestibular function, there is no apparent movement of real targets at any time. Further experiments carried out on three

normal subjects and one bilateral labyrinthine defective revealed that, in the change from 1 g to zero g, there is an involuntary upward eye movement in normals that lasts at least 150 msec. The failure to demonstrate this in the labyrinthine defective subject suggests, therefore, that the change is reflex and probably otolithic in origin. Author

N64-25847 Flying Personnel Research Committee (Gt. Brit.)

VISUAL ILLUSIONS OF MOVEMENT

T. C. D. Whiteside (Inst. of Aviation Med., RAF) A. Graybiel, and J. I. Niven (Naval School of Aviation Med.) Air Ministry, Jun. 1963 20 p refs (FPRC/1207)

Visual illusions are related to involuntary eye movements, occurring either spontaneously as in the autokinetic illusion, or in response to the special stimuli associated with the other two illusions. During fixation, the visual sensation of movement seems to be produced by, or related to, the pattern of efferent activity aimed at the group of extraocular muscles that will act as antagonists to the involuntary eye movement referred to. Under certain circumstances, when the stimulus change is rapid, an eye movement may be detected before the fixation reflex has time to operate. Since the sensation can be caused by the pattern of antagonist efferent activity, it can arise during fixation with no demonstrable responsible eye movement. The displacements of a visual afterimage as a result of the involuntary eye movements, are predominantly in the direction of agonist activity. Author

N64-25848 Flying Personnel Research Committee (Gt. Brit.)

THE IDEAL RELATIONSHIP BETWEEN INSPIRED OXYGEN CONCENTRATION AND CABIN ALTITUDE

J. Ernsting (Inst. of Aviation Med., RAF) Air Ministry, Apr. 1963 16 p refs Presented at the 34th Ann. Meeting of the Aerospace Med. Assoc. (FPRC-1214)

The factors that determine the physiologically desirable relationship between the concentration of oxygen in the inspired gas and the absolute pressure within a pressure or sealed cabin were reviewed. The minimum acceptable concentration of oxygen at a given cabin altitude is determined by the need to prevent hypoxia both in the steady state and following a sudden decompression. The maximum allowable concentration of oxygen is influenced principally by the direct toxic effects of oxygen upon the respiratory tract, and by the need to reduce the possibility of gross pulmonary atelectasis in the presence of blockage of the airways induced by exposure to accelerative forces. The incidence of decompression sickness is the main factor that limits the maximum cabin altitude, and it can also influence the composition of the gas breathed in the intact cabin if depressurization of the cabin or the use of a full pressure suit have to be considered. Although in certain areas there is conflict between these various requirements the physiological ideal at cabin altitudes below 20,000 ft is an inspired oxygen concentration of 50%. Author

N64-25880 Brandeis U., Waltham, Mass.

SPECIFICITY OF THE COMPLEMENTARY RNA FORMED BY *BACILLUS SUBTILIS* INFECTED WITH BACTERIOPHAGE SP8

J. Marmur, C. M. Greenspan, E. Palecek, F. M. Kahan, J. Levine et al Repr. from Cold Spring Harbor Symp. on Quant. Biol., v. 28, 1963 p 191-199 refs (Grant NsG-375)

Some of the properties of SP8 DNA and the consequences of infection upon host biosynthesis are presented. Also presented is a discussion of a study of DNA-RNA hybridization. The DNA of bacteriophage SP8 (whose host is *Bacillus subtilis*) when denatured yielded two components of differing buoyant density in cesium chloride density gradients. The denser of the two strands, the H strand, contained more pyrimidines and fewer purines than the lighter L strand. Only the H strand formed hybrids with a pulse-labeled RNA synthesized by the infected host. The L strand is capable of annealing with complementary RNA synthesized *in vitro* and works as a primer in reactions catalyzed by RNA polymerase. During the vegetative development of phage, host cells synthesize RNA at normal rates. A small fraction of this RNA forms hybrids with denatured bacterial DNA. Bacteriophage DNA was found not to hybridize with host DNA (in agar-gel columns), which is taken to indicate that the RNA-DNA complexes reflect host messenger synthesis. It is concluded that only one of the two complementary strands of bacteriophage SP8 DNA acts as a template for the synthesis of phage specific RNA *in vivo*. P.V.E.

N64-25892 Geoscience Ltd., La Jolla, Calif.

THERMAL AND ELECTRICAL CONDUCTIVITIES OF BIOLOGICAL FLUIDS AND TISSUES Annual Report, Apr. 1, 1963-Mar. 31, 1964

H. F. Poppendiek, N. D. Greene, V. H. Breeden, J. R. Murphy, and P. M. Morehouse [1964] 38 p refs (Contract Nonr-4095(00)) (GLR-20; AD-438144)

This report describes research on thermal and electrical conductivities of biological fluids and tissues. A literature search on thermal and electrical conductivity of biological materials was conducted. Analytical studies were initiated that will make it possible to estimate or establish the controlling variables of thermal and electrical conductivities of biological fluids and tissues. The results are for correlating more effectively the experimental measurements obtained. Author

N64-25906 Aeronutronic, Newport Beach, Calif. Research Labs.

STUDY OF THE FUNDAMENTAL PRINCIPLES OF BIO-ELECTROCHEMISTRY Final Technical Report, Mar. 1963-Mar. 1964

R. C. Bean, Y. H. Inami, P. R. Basford, M. H. Boyer, W. C. Shepherd et al 30 Jun. 1964 111 p refs (Contract NASw-655) (NASA-CR-54051; U-2670) OTS: \$9.60

Reactions of biological systems at an electrode were investigated experimentally and through theoretical considerations to determine the capability of biochemical reactions in producing useful electrochemical energy. Experimental work with microorganisms and several enzymes established that electrochemical energy may be derived either through formation of enzymatic conversion of electrochemically inactive fuels to active products or from electron exchange between the electrode and the enzyme via an electron carrier intermediary molecule. However, no evidence was obtained for a significant electron transfer directly from enzymes to the electrode. Were such a reaction to exist, theoretical calculations for a model system suggest that the maximum current through the direct reaction would be very small in relation to the output possible from the other types of reactions. There is need for extreme care in defining the actual reactive electrochemical systems in the biofuel cells since extraneous materials in the biological systems may be responsible for relatively large, temporary electrical outputs. Author

N64-25925 Linde Co., Tonawanda, N.Y. Research Labs.
**THE PHYSIOLOGICAL EFFECTS OF ARGON, HELIUM,
 AND THE RARE GASES**

H. R. Schreiner 30 Apr. 1964 104 p refs
 (Contract Nonr-4115(00))
 (AD-600641)

Basic studies in inert gas physiology were conducted. The investigations were primarily concerned with the elucidation of effects of the metabolically inert gases helium, neon, argon, krypton, xenon, and of nitrogen on cellular systems, on the neuromuscular complex, and on intact animals. Observation of the protoplasmic streaming activity of hyphal cells of the fungus *Neurospora crassa* demonstrated the specific and reversible inhibition of this cellular process by krypton and xenon. Experiments conducted with helium and nitrogen at pressures ranging up to 1.775 psia indicate that the growth retardation of *Neurospora crassa* by krypton and xenon cannot be related to a critical intracellular concentration of metabolically inert gases. The responses of the frog sciatic nerve-gastrocnemius muscle complex to compressed inert gases were studied. Experimentation with instrumented unanesthetized rats did not reveal electroencephalographic evidence of inert-gas anesthesia when the animals were exposed to 206 to 220 psia neon, argon, or nitrogen in the presence of 14.7 psia oxygen. In general, it is concluded that metabolically inert gases have the ability to interact with a wide variety of biological systems on levels that range from subcellular to that of the intact higher animal. P.V.E.

N64-25948 National Aeronautics and Space Administration,
 Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY - Continuing Bibliography, 1 Jan.-31 Mar. 1964

Jul. 1964 293 p refs
 (NASA-SP-7011) OTS: \$2.00

Aerospace Medicine and Biology, a monthly publication, is an annotated bibliography concentrating on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order will also be included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors will receive attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. I.v.L.

N64-25950 Republic Aviation Corp., Farmingdale, N.Y.
**BIOMEDICAL AND HUMAN FACTORS REQUIREMENTS
 FOR A MANNED EARTH ORBITING STATION**

W. Helvey, C. Martell, J. Peters, G. Rosenthal, F. Benjamin et al Washington, NASA, 3 Jan. 1964 442 p refs
 (Contract NASw-776)
 (NASA-CR-56021) OTS: \$22.25 ph

Space environmental factors that are believed to have a significant effect on man were evaluated. These included those factors characteristic of the space environment (e.g., weightlessness, radiation) as well as those created within the space station (e.g., toxic contaminants, capsule atmosphere). An appraisal was made of the anticipated response of the astronaut to each of these factors. Also, the major organ systems and functions of the body were delineated, and a determination was made of their anticipated response to each of the environmental categories. A judgment was then made on the medical significance or importance of each response. This enabled a determination of which physiological and psychological effects should be monitored. Concurrently, an extensive list of measurement

techniques and methods of data management were evaluated for applicability to the space-station program. Various space-station configurations and design parameters were defined in terms of the biomedical and human-factors requirements necessary to provide the measurements program. Research designs of experimental programs for various station configurations, mission durations, and crew sizes were prepared, and a trade-off analysis of the critical variables in the station planning was completed that contains recommendations to enhance the confidence in the measurement program. I.v.L.

N64-25951 Air Force Systems Command, Wright-Patterson
 AFB, Ohio Foreign Technology Div.

**AN ANALYSIS OF CONDITIONED REFLEXES AND
 OF THE THOUGHT PROCESSES OF THE HUMAN BRAIN**
 A. V. Napalkov and N. I. Bobneva 26 Mar. 1964 31 p
 refs Transl into ENGLISH from Vopr. Psikhologii (Moscow),
 no. 6, 1962 p 40-54
 (FTD-TT-64-184/1+4; AD-600585)

The development of a pattern of conditioned reflex chains in humans is described. The reflex chains were attained through a series of exploratory experiments. A pattern of reflex chains was formulated, and rules for working out the principles of information systems within the brain were determined. These rules determine the appearance, at a given moment in time, of random trial movements. In other states of the development of conditioning, random movements disappear and completely predictable movements appear. It was possible to establish several rules of choosing and processing information. It was found that the conditioning signals are significant as reinforcing stimuli that enter into an already developed chain of reflexes. For this, however, reinforcement must occur twice (double reinforcement). R.T.K.

N64-25970 National Aeronautics and Space Administration,
 Ames Research Center, Moffett Field, Calif.

CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE

Cyril Ponnampetuma Repr. from Nature, v. 201, no. 4917,
 25 Jan. 1964 p 337-340 refs Previously Published as
 NASA-TM-X-54008; see N64-22754 16-16
 (NASA-RP-233; NASA-TM-X-54008)

This is a contemplative, nontechnical review of the origin of life as viewed by scholars and philosophers of the past. Modern chemical knowledge is related to early cosmogenic hypotheses. G.D.B.

N64-25975 National Aeronautics and Space Administration,
 Washington, D.C.

**CONTROL OF BEHAVIOR BY DRUG-PRODUCED INTERNAL
 STIMULI**

Richard E. Belleville Repr. from Psychopharmacologia, (Berlin), v. 5, 1964 p 95-105 refs
 (NASA-RP-262)

Groups of rats were trained on a lever-pressing response under morphine, D-amphetamine, and placebo conditions. To assess the effects of changing internal stimuli, comparisons were made between groups extinguished under the same drug conditions, with those extinguished under different drug conditions. A greater number of extinction responses were made by those groups that received the same drug during both procedures. In a second extinction session, all animals received the same drug as that given during acquisition. A greater number of responses were emitted by those groups that were previously exposed to extinction under a drug condition different from that under which the response was acquired. The use of drugs for manipulating internal states is discussed. G.D.B.

N64-26000 Flying Personnel Research Committee (Gt. Brit.)

HAND PREFERENCE IN AIRCREW: A STUDY OF THE CONSISTENCY AND STRENGTH OF LATERAL PREFERENCE FOR SIMPLE UNIMANUAL TASKS

J. L. Gedye Air Ministry, Nov. 1963 19 p refs (FPRC/MEMO-203)

A preliminary account of an investigation designed to provide more information about the likely importance of laterality factors for the understanding of difficulties in flying was conducted. A comparative study of hand preference patterns in groups of pilots at different stages of training indicates that there is some relationship between hand preference pattern and flying skill. Both the consistency and strength of lateral preference are important. R.T.K.

N64-26025 Aerojet-General Corp., Sacramento, Calif.
HUMAN RELIABILITY IN THE PERFORMANCE OF MAINTENANCE

Irl A. Irwin, Joel J. Levitz, and Alvyn M. Freed May 1964 71 p refs (Contracts AF 04(694-424, Suppl. Agreement 24; AF 04 (647)-521) (LRP-317/TDR-63-218; AD-600176)

A method for estimating the reliability of maintenance performance is developed and applied to tasks involved in scheduled maintenance for Titan II engines. The approach involves the combined use of ratings and empirically derived reliability figures. A modification of the design engineer's redundancy formula is developed for estimating the increase in human reliability achieved when two mechanics work together in the performance of a single maintenance task. This study demonstrates that highly consistent ratings of task element reliability can be obtained from groups of qualified raters. Author

N64-26043 California U., Davis School of Veterinary Medicine

THE EFFECTS OF CONTINUED Sr^{90} AND Ra^{226} ON THE BEAGLE 7th Annual Progress Report

A. C. Andersen, Jul. 1964 170 p refs (Contract AT(04-3)-472) (UCD-472-110)

Maintenance of a Beagle breeding colony has required routinely culling stock for reasons of age, poor conformation, and inability to breed. Observations have shown 147 separate clinical conditions in a 1-year period (average weekly population—approximately 285 dogs). Treatment of these conditions was routine. Experimental dog production has greatly increased, and there are at present 193 animals representing 16 different levels of either Sr^{90} ingestion, Sr^{90} injection, Ra^{226} injection or controls. Clinical conditions observed in this group totalled 113 (201 dogs). Facilities are functioning effectively. Author

N64-26053 Indiana U., Bloomington
ELECTROPHYSICAL EFFECTS OF SHORT-TERM SENSORY DEPRIVATION

Robert M. Stern Nov. 1963 16 p refs (Contract Nonr-908(15)) (TR-9; AD-437810)

It was the purpose of this study to investigate the effects of two different sensory deprivation situations for a period of one hour. The effects were measured in terms of the electrophysiological activity of the autonomic nervous system and the skeletal muscle group. A vigil group reported the movements of an autokinetic light, while a rest group simply relaxed. The autonomic indices revealed significantly higher somatic activity for the vigil group, thus

supporting Malmo's hypothesis concerning the importance of task demands in determining the level of physiological activity. G.D.B.

N64-26055 Joint Publications Research Service, Washington, D.C.

THE STATE OF HEMOPOIETIC TISSUE IN ACUTE RADIATION SICKNESS UNDER CONDITIONS OF BONE MARROW TRANSPLANTATION

N. S. Rozanova, V. N. Malanina, G. V. Sukyasyan, and M. N. Novikova 26 Jun. 1964 16 p refs Transl. into ENGLISH from Arkhiv Patologii (Moscow), v. XXVI, no. 4, 1964 p 32-40 (JPRS-25251; TT-64-31556) OTS: \$0.50

This is a study of the character of changes in the hemopoietic tissue of animals with acute radiation sickness treated by the administration of bone marrow. Pathological-anatomical examination of 29 dogs after irradiation was made. The intravenous or intraosseous administration of bone marrow did not prevent the development of acute radiation sickness in animals irradiated with a minimal lethal dose (LD_{95}). G.D.B.

N64-26056 Joint Publications Research Service, Washington, D.C.

CURRENT DATA ON THE STRUCTURE, PROPERTIES AND PATHOLOGICAL CHANGES OF ELASTIC STRUCTURES

L. D. Zherebtsov 26 Jun. 1964 24 p refs Transl. into ENGLISH from Arkhiv Patologii (Moscow), v. XXVI, no. 4, 1964 p 3-17 (JPRS-25252; TT-64-31557) OTS: \$0.75

This is a survey of the great advances made in recent years in the study of fibrous components of connective tissue, including elastic structures and the nature of the changes taking place in elastic in the course of various physiological and pathological processes. The chemical composition of elastic structures is described. Elastase and elastolysis are discussed. The ultrastructure of elastic fibers is considered. Systematic pathological changes in elastic structures are examined. G.D.B.

N64-26086 Joint Publications Research Service, Washington, D.C.

ULTRASONIC VIBRATIONS IN MOLECULAR BIOPHYSICS

I. Ye. El'piner 30 Jul. 1964 36 p refs Transl. into ENGLISH from Uspekhi Sovrem. Biol. (Moscow), v. 57, no. 2, 1964 p 211-231 (JPRS-25651; TT-64-31923) OTS: \$2.00

Experimental material obtained in studying the biological action of ultrasonic waves is systematized and generalized. The accumulated experimental material is divided into four divisions: (1) use of ultrasonic waves in the synthesis of biologically important products—micromolecular and macromolecular compounds; (2) study of the action of ultrasonic waves on the structure of biomolecules and biomacromolecules in an attempt to establish the bonds between the structure and function of these substances; (3) use of ultrasonic waves to determine the topography of biocatalytic processes in animal, plant, and bacterial cells; and (4) study of the influence of ultrasonic waves on the space location of membrane and intracellular submicroscopic structures. P.V.E.

N64-26092 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

THE AURICULAR ELECTROKRYMOGRAM

G. Bohenszky, Z. Bokor and E. Rozsa 3 Jun. 1964 13 p refs Transl. into ENGLISH from Orvosi Hetilap (Hungary), v. 104,

no. 21, 21 May 1963 p 981-984
(FTD-TT-64-271/1+2+3+4; AD-442432)

Normal atrial electrokymograms and the diagnostic significance of pathological curves observed in the most frequently occurring vitia are discussed. It is concluded that examination of the atrial contour pulsations can yield delicate details of the atrial movements and also valid conclusions as to the hemodynamic conditions. P.V.E.

N64-26113 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
THE EFFECT OF LIGHT ON GROWTH AND PHOTOSYNTHESIS OF CHLORELLA

A. M. Stepanova 12 May 1964 27 p refs Transl. into ENGLISH from Vestn. Leningr. Univ. (Leningrad), no. 21, 1963 p 72-78
(FTD-TT-64-246/1+2+4; AD-601552)

The form of the growth curve of algae that are supplied with all nutrient elements is closely connected to the dynamics of the photosynthetic rate. The latter, in turn, depends on light absorption by the culture and on the quantity of light striking each individual cell. The reactions of *Chlorella pyrenoidosa* and *Chlorella vulgaris* to a change in day length were identical. The largest increase in growth in both types and the smallest photosynthetic rate were observed during continuous illumination. As the dark period increased to 12 hours the photosynthetic rates increased, but further increase of the dark period (to 18 hours) did not noticeably affect the photosynthetic rate. J.L.D.

N64-26197 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
PHYSIOLOGICAL BASE-LINE STUDIES FOR CHIMPANZEES UNDER STABLE CONDITIONS OF FLIGHT
Thomas L. Gleason, III, and W. E. Ward (USAF Acad.) Mar. 1964 22 p refs
(ARL-TDR-64-4; AD-440106)

Physiological base lines for chimpanzees under stable conditions of flight were obtained. The characteristic of flight as well as physiological measurements made from flight to flight was statistically analyzed for 7 experienced animals and 7 naive animals. The more experienced subjects adapted more rapidly physiologically to aircraft flights. Both inter and intra animal analyses were performed. Heart rate, skin, and rectal temperature were slightly higher among the nonexperienced animals, while respiration rate was slightly higher in the experienced group. Author

N64-26212 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
AN ELECTROENCEPHALOSCOPE WITH DUAL COMMUTATION

V. M. Anan'yev 23 Mar. 1964 13 p refs Transl. into ENGLISH from Elektron. V Med. (Moscow), 1960 p 62-70
(FTD-TT-63-1190/1+2+4; AD-437117)

A system for visual display and photographic recording of as many as 50 signal channels from an electroencephalograph is described. A plan for sequential sampling and signal amplification is set forth, and multiplex circuits are shown schematically. D.E.W.

N64-26235 Naval Ordnance Test Station, China Lake, Calif.
AIRCRAFT RANGES FOR TRAINING PILOTS IN SPECIAL-WEAPON-DELIVERY TECHNIQUES
Everett B. Hill Jun. 1964 40 p refs
(NOTS-TP-3346; NAVWEPS-8414; AD-443069)

This report describes in detail the instrumentation necessary for training aircraft pilots in special-weapon delivery techniques. The essential elements* of the system are a tracker-plotter to outline the path of the aircraft in a vertical plane at the flight line and a telescope skyscreen to accurately measure the aircraft's speed while performing these maneuvers. Author

N64-26237 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
PLOTTING AND ANALYZING CUMULATIVE RESPONSE CURVES IN OPERANT CONDITIONING STUDIES
Robert M. Herrick 2 Jun. 1964 31 p
(NADC-ML-6406; AD-602477)

Because the response and time scales typically used in plotting cumulative response curves are poorly selected, ineffective displays often result. The visual cue of a rate change is the difference, $\Delta\theta$, between the angles, θ_1 and θ_2 , representing the two rates, R_1 and R_2 . These variables are related by: $\tan \theta_2 = R_2/R_1 \tan \theta_1$. For a given rate change, the value of θ_1 , viz., $M\theta_1$, that yields the maximum value of $\Delta\theta$, viz., $\Delta\theta_{max}$, is given by $M\theta_1 = \arcsin (R_1/R_1 + R_2)^{1/2}$. Ideally, the initial response rate should be represented by the $M\theta_1$ appropriate for a given rate change. Because of practical considerations, however, some compromises with the ideal are allowable. Included in the discussion are steps required to select appropriate response and time scales, with examples, and guideposts for evaluating rate changes by means of angular changes. Author

N64-26257 Joint Publications Research Service, Washington, D.C.
WHAT IS BIONICS?
P. T. Astashenkov 17 Jul. 1964 82 p refs Transl. into ENGLISH of the Book "Chito Takoye Bionika" Moscow, Mil. Publ. House of the Min. of Defense USSR, 1963 p 1-88
(JPRS-25494; TT-64-31766) OTS: \$2.00

The following topics are included: (1) the origin and development of cybernetics; (2) sensory organs; (3) biocurrents and control at a distance; (4) location and navigation in nature and technology; (5) self-adjusting systems in biology and automatic devices; (6) electronic machines and the brain. R.T.K.

N64-26269 School of Aerospace Medicine, Brooks AFB, Tex.
OXYGEN AND THE EYE
Cecil C. Beehler Feb. 1964 23 p refs
(SAM-Review-3-64; AD-438909)

A summary is presented of literature dealing with the effects of high-oxygen environments on the visual mechanisms. Subjects covered by the summary concern ocular physiology, and the effect of oxygen on immature and mature retina. In general, it is indicated that oxygen is capable of producing severe systemic toxicity, and experimental studies in many animals have revealed a variety of pathologic changes, some of which resemble those found in retrolental fibroplasia. P.V.E.

N64-26278 Indiana U., Bloomington
LONG-TERM OBSERVATION OF THE AUTOKINETIC ILLUSION: FREQUENCY AND DIRECTION OF MOVEMENT
Robert M. Stern Jan. 1964 11 p refs
(Contract Nonr-908-15)
(TR-10; AD-437811)

This study was designed to test reports of autokinetic movement increase with increasing exposure time and reports of movement in the vertical plane occurring with greater frequency than reports of movement in the horizontal plane. Forty

subjects, who were told that they were radar watchkeepers, observed a pin point of light in a dark room for 30 min and indicated the direction of "apparent movement. The results obtained supported both hypotheses. The increase in reports of movement is accounted for in terms of increased suggestibility due to the effects of sensory deprivation. A possible explanation for the greater frequency of reports of vertical movement is discussed in terms of Kunnapas' theory of the relevance of the horizontally extended oval shape of the visual field for the horizontal-vertical illusion. Author

N64-26348 Royal Canadian Air Force, Toronto Central Experimental and Proving Establishment
HIGH ALTITUDE MAN SEAT STABILIZATION STUDY
A. J. Campbell, comp. Jan. 1964 28 p refs
(CEPE-1681; AD-438523)

It was determined that man-stabilizing systems in existence may be useful. During the examination of the seat-man stabilizing proposal, it was discovered that, if high-energy rockets were to provide a reasonable escape envelope at low altitude and if the high-altitude drogues were to be deployed without tangling, a method of stabilizing the seat during rocket burning was required. Man-seat stabilization during descent could be provided by adding to the system a small drogue required during rocket burning. Man-seat stabilization was considered to be a more satisfactory method than man stabilization; therefore preliminary design of a system to stabilize CF104 seat was completed. It was recommended that the design developed herein be tested as a method of effectively using high-energy rockets at all altitudes. Author

N64-26351 Israel Program for Scientific Translations, Ltd., Jerusalem
BLOOD CIRCULATION IN THE BRAIN
B. N. Klovskii [1963] 316 p refs Transl. into ENGLISH of the Book "Tsirkulyatsiya Krovi v Mozgu" Moscow, Medgiz, 1951
(OTS-63-11171) OTS: \$3.25

Work on the problems concerning blood circulation in the brain involved investigations of collateral blood circulation in the brain, reflex influence of dura matter irritation on blood pressure and respiration, the innervation pial vessels of the brain, the reactions of pial and intracerebral vessels to nervous and humoral influences, the relationships between nerve cells and capillaries, and brain pulsations in open skulls and their absence in hermetically closed skull cavities. P.V.E.

N64-26357 Library of Congress, Washington, D.C. Aerospace Technology Div.
SPACE MEDICINE
V. V. Parin, ed. 15 Jul. 1964 71 p Transl. into ENGLISH from the book "Aviatsionnaya i Kosmicheskaya Meditsina: Materialy Konferentsii 1963 Goda" Moscow, 1963 *Its* ATD Press, v. 3, no. 10

This book consists of a collection of papers presented at a conference on aviation and space medicine held in 1963, under the joint sponsorship of the Academy of Medical Sciences U.S.S.R., the Pavlov All-Union Physiological Society, and the Moscow Physiological Society. The emphasis is on space medicine and subjects specifically germane to manned space flight, rather than on systems, hardware, and lower forms of life. The majority of these papers deal with effects of acceleration, weightlessness, and altered respiratory environments. Problems of sensory physiology and effects of isolation and hypodynamia are also covered. R.T.K.

N64-26372 Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena
EFFECTS OF STERILIZING AGENTS ON MICROORGANISMS Supplement to Literature Search No. 260
Janet Swift, comp. Mar. 1963 74 p refs
(Contract NAS7-100)
(NASA-CR-58123) OTS: \$7.60 ph

A partially annotated bibliography of the following is presented: (1) physical agents—general radiation, gamma radiation, X-radiation, ultraviolet radiation, acoustics, and temperature variation; (2) chemical agents—ethylene oxide, β -propiolactone, ozone, propylene oxide, pesticides, and antibiotics; and (3) miscellaneous agents—general agents physical-chemical combinations. I.v.L.

N64-26459 Joint Publications Research Service, Washington, D.C.
PHYSIOLOGICAL ANALYSIS OF THE EFFECTS OF PRECEDING MUSCULAR EFFORTS ON THE WORKING CAPACITY OF UNFATIGUED MUSCLES
I. V. Muravov and F. T. Tkachov 27 Jul. 1964 13 p refs
Transl. into ENGLISH of an article from Fiziol. Zhur., Akad. Nauk Ukr. RSR (Kiev), v. 10, no. 2, Mar.-Apr. 1964 p 163-170
(JPRS-25593; TT-64-31865) OTS: \$1.00

A study was made of changes in the work capacity of flexor muscles of the right forearm under the effect of a different type of preliminary activity of symmetric muscles of the left arm. The study was conducted on young people (14 to 26) and aged persons (60 to 79); the method of ergography under conditions of repeated dynamic work was applied. A number of general regularities pertaining to the effect of preceding work of one muscle group on the work capacity of other groups was detected. The type of effect exerted by preceding effort on the work capacity of unfatigued muscles both in young and aged persons depends on the intensity of the preceding activity. Author

N64-26475 RAND Corp., Santa Monica, Calif.
ESTIMATION OF HEART PARAMETERS USING SKIN POTENTIAL MEASUREMENTS
R. Bellman, C. Collier, H. Kagiwada, R. Kalaba, and R. Selvester May 1964 17 p refs
(NIH GM-09608-02)
(RM-4138-NIH; AD-600754)

A mathematical model relating ventricular dipoles to surface potentials is sketched. The inverse problem—that of determining heart parameters on the basis of skin potential measurements—may be viewed as a nonlinear multipoint boundary value problem. Some numerical experiments show that quasilinearization provides a feasible method of solution. Author

N64-26499 Royal Inst. of Tech., Stockholm (Sweden) Speech Transmission Lab.
ACOUSTIC SPECIFICATION OF SPEECH Technical (Final) Report, STL Annual Report 1963
C. G. M. Fant 25 Jan. 1964 14 p refs
(Grant AF-EOAR-63-55)
(AFCRL-64-263; AD-600865)

The main body of this report contains summaries of 12 articles from the STL-QPSR of 1963. A main emphasis was laid on speech analysis techniques and the correlation of data from cineradiographic and spectrographic studies. These studies made it possible to present a simple mathematical model for describing formant frequency variations as a function of vowel duration and consonantal context. A special study emphasized the high degree of coarticulation between vowels and adjacent consonants and even one vowel across

a consonant to the next vowel of the sequence. A considerable effort was laid on developing suitable routines for the cineradiography. A separate study was initiated with the scope of completing representative spectrographic material of Swedish and American-English speech. Other studies were concerned with the structure of the vocal source for voiced sounds by means of spectrum-matching techniques. Earlier theoretical studies of the mathematical and experimental procedure of defining formant amplitudes were followed.

Author

N64-26544 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENTS OF HUMAN TRANSFER FUNCTION WITH VARIOUS MODEL FORMS

James J. Adams and Hugh P. Bergeron. Washington, NASA, Aug. 1964 35 p refs

(NASA-TN-D-2394) OTS: \$1.00

Human transfer functions, relating the pilot's visual input (i.e., the displayed error) to his stick controller output, were measured by using an automatic model matching technique. In this method, several gains in an analog model with a fixed, preselected form are automatically adjusted to provide the best match to the time history of the pilot's output. In the present investigation input and output data recorded on magnetic tape were analyzed several times with different model forms to determine whether one form had an advantage over another. The different forms included various amounts of fixed time delay and various arrangements of the gains in the linear portion of the model. Time histories of the outputs, closed-loop characteristics calculated by using the measured transfer functions, and system errors obtained with the model in the loop were examined. Results showed no particular advantage for any one model over all the others. The close agreement in results obtained with several of the models indicates that a good linear model for a human pilot was obtained. Results also indicate that using this model gives smaller system errors than using a pilot.

Author

N64-26550 Chicago Medical School, Ill. Div. of Cardiovascular Research

EFFECT OF OXYGEN INHALATION ON RESPONSES TO COLD EXPOSURE Annual Progress Report, Oct. 1, 1962-Sep. 20, 1963

D. M. Mac Canon [1963] 23 p refs

(Grant DA-MD-49-193-G43)

(AD-600077)

The experiments completed confirm the cold threshold raising effect of oxygen inhalation and emphasize the danger of relying solely on physical calculations of the intensity of a thermal stimulus. Indirect evidence that oxygen inhalation hinders carbon dioxide transport continues to accumulate. Instrumentation analyses suggest methods for improving polarographic measurements for pO_2 and for the infrared carbon dioxide analyzer.

Author

N64-26609 Allied Research Associates, Inc., Concord, Mass.

A REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN

J. Healer, H. Homonoff, C. Jamieson, D. Kimura, S. Koslov et al. Washington, NASA, Jul. 1964 316 p refs

(Contract NASw-535)

(NASA-CR-76) OTS: \$5.00

This report summarizes the results to date of a review of biological mechanisms for application to instrument design and engineering performed for NASA. Principles of biosensor organization, structure, and function throughout the sensed

parameters were investigated. The biosensors discussed were mechanoreceptors, photoreceptors, chemoreceptors, and thermoreceptors. The neural aspect of sensory functions and its application are discussed.

I v. L.

N64-26633 Institute of Cancer Research. Royal Cancer Hospital, London (Gt. Brit.)

AN INVESTIGATION INTO THE MECHANISM OF ACTION OF RADIATION PROTECTIVE CHEMICALS Half Yearly Report, 1 Sep. 1963-1 Mar. 1964

P. Alexander [1964] 22 p

(Contract DA-91-591-EUC-3105)

(AD-439992)

There was considerable transfer of energy from the bovine serum albumin (BSA) to the DNA, when these two substances were dissolved, and the resultant solution was freeze dried. No indication of energy transfer was observed in a crude mixture wherein the two dry substances were just shaken together. A new effect of the SH compounds was observed in *E. coli* that did not involve a repair of radicals, but a change in their character. Some radicals were stable at room temperature, and some radicals disappeared on warming from -196° F to room temperature. Both the stable and unstable radicals showed similar repair action under the effect of cysteamine. In the presence of cysteamine, both types of radicals, formed in the bacterial cells, become peroxidized. These peroxy radicals were unstable. Iodoacetamide had a pronounced effect on the production of radicals in proteins and nucleoproteins. Targets other than DNA were considered. The fact that dose modification by SH compounds and iodoacetamide occurs when these substances cannot penetrate into the interior of bacterial cells suggests that important targets may be macromolecules near the plasma membrane of these cells.

I v. L.

N64-26653 Florida U., Gainesville. College of Medicine
EFFECTS OF THE COMPRESSIBILITY OF ALVEOLAR GAS ON THE DYNAMICS AND WORK OF BREATHING

M. J. Jaeger and A. B. Otis. Brooks AFB, Tex., School of Aerospace Med., Oct. 1963 19 p refs

(Contract AF 41(609)-1553)

(SAM-TDR-63-71, AD-437863)

Alveolar gas is compressed and expanded during every breathing cycle. The volume displacement measured at the mouth V_T (tidal volume) is therefore smaller than the volume displacement of the lung V_T that may be measured with a body plethysmograph. Experimental data found in normal subjects and in patients with obstructive emphysema confirm the theory that the ratio V_T/V_T decreases with increasing airway resistance, breathing frequency, and lung volume. There was little effect in normal subjects breathing at different breathing rates; however, in patients with obstructive emphysema it may be appreciable. With increasing altitude the effect is expected to be more pronounced. The mechanical work performed in compressing and expanding alveolar gas may be determined by recording the volume displacement of the lung simultaneously with tidal volume and intra-esophageal pressure. Normally, work related to compressibility is insignificant, but in patients with obstructive emphysema, it becomes appreciable during hyperpnea. The compressibility of alveolar gas also increased the negative work performed by respiratory muscles.

Author

N64-26665 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (W. Germany). Inst. für Flugmedizin
THE SIGNIFICANCE OF DECOMPRESSION SICKNESS FOR SPACE TRAVELERS [DIE BEDEUTUNG DER DRUCKFALLKRANKHEIT FÜR DIE RAUMFAARER]

H. Hartmann [1963] 13 p In GERMAN Repr. from Proc. of the 12th Rocket and Space Travel Meeting of the Deutsche Raketen-Ges., Hamburg, 20-22 Sept. 1963 In GERMAN (DVL-351)

Decompression sickness is reviewed. The etiology of decompression sickness is gas-bubble formation in the vascular system and in tissues. At an altitude of 12,000 meters, an air bubble is five times its original size. Since the lungs, due to the rib cage, cannot expand accordingly, excess pressure builds up in the lungs. The greater the volume of air in the lungs, the greater is the danger of decompression. In addition, greater heights can be more safely attained when the pressure drop does not follow normal pressure, but follows a low pressure level. Increased pressure in the lungs leads to a pressure increase in the pulmonary arteries that, in turn, can lead to air embolism in the brain and in the vessels of the heart. Performing a pneumothorax or a pneumoperitoneum operation has prevented air embolism in rats; it can also be conducted on man. All cases of decompression sickness should be treated in a pressurized chamber; however, flight physicians have had little or no experience with treatment in such a chamber, and very few such chambers exist. I.v.L.

N64-26675 Royal Inst. of Tech., Stockholm (Sweden) Speech Transmission Lab.
[SPEECH ANALYSIS AND PERCEPTION] Quarterly Progress and Status Report No. 13, July-September 1963
Gunnar Fant 15 Oct. 1963 43 p refs
(Contract DA-91-591-EUC-3080; Grants AF-EOAR-63-55; NIH-G-NB-04003-01)
(STL-QPSR-3(1963); AFCRL-64-15; AD-439617)

The following studies are discussed: (1) speech analysis—spectrograms of U. C. Swedish stops, and spectrum envelopes for synthetic vowels; and (2) speech perception—a study in French intonation. R.T.K.

N64-26710 National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
THE HYDROLYSIS OF AMINO ACYL- β -NAPHTHYLAMIDES BY PLASMA AMINOPEPTIDASES
J. Ken McDonald, Thomas J. Reilly, and Stanley Ellis Repr. from Biochem. Biophys. Res. Commun., v. 16, no. 2, 1964 p 135-140 refs
(NASA-RP-236)

Investigations were conducted of the hydrolysis of amino acyl- β -naphthylamides by plasma aminopeptidases. Results indicate that a variety of aminopeptidases can occur in blood plasma. At least three major aminopeptidases could be distinguished in plasma: (1) The aminopeptidase(s) of normal plasma, was predominantly thiol-independent, Co^{++} -activated, and puromycin-sensitive. The L-alanine- β -naphthylamide and L-methionine- β -naphthylamide were substrates most readily hydrolyzed by whole plasma. (2) The thiol-activated aminopeptidase(s), which appeared in plasma in association with tissue injury, was thiol-independent, Co^{++} -activated, and Mn^{++} -activated and puromycin-sensitive. The L-lysine- β -naphthylamide and L-arginine- β -naphthylamide were the preferred substrates. (3) Leucine aminopeptidase, which was only detectable in plasma in the event of tissue injury, was thiol-independent, Mn^{++} -activated, and puromycin-insensitive. The L-leucine- β -naphthylamide was the substrate most readily hydrolyzed. I.v.L.

N64-26711 National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
INHIBITION OF THIOL-ACTIVATED AMINOPEPTIDASE BY PUROMYCIN
Stanley Ellis and Manuel Perry Repr. from Biochem. Biophys. Res. Commun., v. 15, no. 6, 1964 p 502-505 refs
(NASA-RP-252)

Pituitary extracts have been shown to contain a thiol-activated aminopeptidase(s) that preferentially hydrolyzes dibasic amino acyl derivatives of p-nitroaniline and β -naphthylamine. In the course of recent studies, it was found that the thiol-activated aminopeptidase was strongly inhibited by puromycin. Leucine aminopeptidase, on the other hand, was not affected by puromycin either in the hydrolysis of p-nitroanilides or dipeptides by pituitary extracts. These findings provide a basis for distinguishing the action of the thiol-activated aminopeptidases on p-nitroanilide substrates from that of leucine aminopeptidase, in addition to the already known differential effects of -SH on these two enzymes. The properties of the thiol-activated aminopeptidases, when considered in relation to the inhibition by puromycin, are suggestive of involvement in amino acyl s-RNA metabolism. I.v.L.

N64-26722 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
ANTIBACTERIAL IMMUNITY AND RADIORESISTANCE
N. N. Klemparskaya, N. V. Rayeva, and V. F. Sosova 1 May 1964 154 p refs Transl. into ENGLISH from the book "Antibakterial'nyy Immunitet i Radiorezistentnost'" Moscow, Medgiz, 1963 p 1-118
(FTD-TT-63-933/1+2; AD-601549)

Immunological mechanisms, the reaction to autoantigenic substances, play an important role in the development of radiation sickness. It is possible to prevent the development of this reaction by immunological methods, one of which is vaccination. The administration of foreign antigens causes a complex reaction in which the nervous system and endocrine systems participate. After the initial symptoms of stress, Selye's alarm reaction, a prolonged characteristic reaction develops on the part of certain cellular elements, primarily the cells of the reticuloendothelial system and the plasmatic and lymphoid elements. The phagocytic functioning of the microphages and macrophages is activated. As a result of the specific change in globulin synthesis, immune bodies begin to develop not only to the antigen in question, the microbe, but also to tissue decomposition products. If vaccination is carried out before irradiation, immunity to the agent in question is not only maintained after exposure to ionizing radiation, but the course of the radiation sickness contracted is considerably altered. Vaccination conducted after irradiation does not have this effect on radioresistance. Two possible ways in which prophylactic vaccination may influence radioresistance are discussed. I.v.L.

N64-26725 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
RADIATION BIOCHEMISTRY
A. M. Kuzin 20 Mar. 1964 443 p refs Transl. into ENGLISH of the book "Radiatsionnaya Biokhimiya" Moscow, Izd. Akad. Nauk SSSR, 1962 p 1-310
(FTD-TT-63-661/1+2; AD-601546)

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1. PHYSICAL CHARACTERISTICS OF IONIZING RADIATION AND THEIR INTERACTION WITH MATTER p 15-28a refs
2. EFFECT OF IONIZING RADIATION ON WATER p 29-34 refs
3. FORMATION OF PEROXIDES BY IONIZING RADIATION p 35-43c refs
4. EFFECTS OF IONIZING RADIATION ON SIMPLE PROTEINS AND THEIR DECOMPOSITION PRODUCTS p 44-73b refs
5. EFFECT OF IONIZING RADIATION ON NUCLEIC ACIDS, NUCLEO-PROTEINS AND OTHER COMPLEX PROTEINS p 74-103d refs

6. EFFECT OF IONIZING RADIATION ON CARBOHYDRATES p 104-112a refs

7. EFFECT OF IONIZING RADIATION ON LIPIDS p 113-122b refs

8. EFFECT OF IONIZING RADIATION ON ENZYMES AND VITAMINS p 123-144b refs

9. EFFECT OF IONIZING RADIATION ON THE IN VIVO ACTIVITY OF ENZYMES p 149-182g refs

10. EFFECT OF IONIZING RADIATION ON THE STATE AND METABOLISM OF NUCLEOPROTEINS AND NUCLEIC ACIDS p 183-237h refs

11. EFFECT OF IONIZING RADIATION ON PROTEIN METABOLISM p 238-260h refs

12. EFFECT OF IONIZING RADIATION ON CARBOHYDRATE METABOLISM p 261-280e refs

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14. EFFECT OF IONIZING RADIATION MINERAL METABOLISM p 301-313c refs

15. FORMATION OF TOXIC SUBSTANCES IN THE IRRADIATED ORGANISM p 314-334e refs

16. BIOPHYSICOCHEMICAL INTERPRETATION OF RADIATION INJURY IN CELLS p 335-373 refs

N64-26736 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

RECONSTRUCTION OF MOLECULES

I. Shabanova 14 Jul. 1964 4 p Transl. into ENGLISH from Vechernyaya Moskva (USSR), 12 Feb. 1964 p 2 (FTD-TT-64-581/1+4; AD-602879)

Research is being conducted on the relationship between the chemical structure of a substance and its biological effect. Often a high therapeutic effect is accomplished by the substitution of one or two links in the complex molecule, and occasionally by the new spatial position of the parts of the same molecule. New compounds were developed with valuable therapeutic properties. For instance, on the basis of a well-known substance, phenothiazine, Chloroatsizine was developed by a complex synthesis. This drug is used in the therapy of stenocardia and infarct of the myocardium. As compared to other medicinals that dilate the vessels of the heart, the advantage of Chloroatsizine is that it does not lower the arterial blood pressure. It works effectively in a number of difficult cases where such common drugs as nitroglycerin, validol, and others are no longer helpful. Also Trimecain was prepared. This anesthetic is effective up to 48 hours and significantly alleviates the postoperative period.

I.v.L.

N64-26757 Federal Radiation Council, Washington, D.C. BACKGROUND MATERIAL FOR THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS

Jul. 1964 19 p

(Rept.-5) GPO: \$0.20

This report contains background material used in the development of guidance for Federal agencies in respect to planning protective actions to reduce potential doses to the population from radioactive fission products that may gain access to food, and doses at which implementation of protective actions may be appropriate. The material is directed to guidance concerned with protective actions affecting the normal production, processing, distribution, and use of food for human consumption when the action is taken because of the radioactive content of the food.

Author

N64-26765 Joint Publications Research Service, Washington, D.C.

ON THE CYBERNETIC APPROACH TO THE PROBLEM OF IMAGE

L. M. Vekker and M. G. Yaroshevskiy 6 Aug. 1964 12 p Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 5, 1964 p 173-177

(JPRS-25761; TT-64-41032) OTS: \$1.00

The cybernetic approach to the problem of the sensual image and perception is discussed, and the dialectic-materialistic theory of image is presented.

R.T.K.

N64-26782 National Aeronautics and Space Administration, Washington, D.C.

PLASMA NONESTERIFIED FATTY ACIDS IN RATS SUBJECTED TO GRAVITATIONAL ACCELERATION [SODERZHANIYE NEESTERIFITSIROVANNYKH ZHIRNYKH KISLOT V PLASME KROVI U KRYSA, PODVERGSHIKHSYA DEYSTVIYU USKORENIY]

A. A. Gyurdzhian, M. A. Lomova, and L. A. Radkevich Aug. 1964 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 151, no. 4, 1963

(NASA-TT-F-197) OTS: \$0.50

Research was conducted on the plasma nonesterified fatty acids (NEFA) concentration in rats subjected to varying amounts of gravitational acceleration—2, 5, and 20 times gravity. Accelerative forces of 10, 15, 25, and 30 times gravity were also used in some experiments. The animals were exposed to the effects of acceleration for 5 minutes in a large laboratory centrifuge (radius = 36 cm). Each rat was placed in a single centrifuge tube, 1.5 liters in volume.

Author

N64-26784 National Aeronautics and Space Administration, Washington, D.C.

RHYTHM VARIATIONS OF NEURONS OF THE RETICULAR FORMATION DURING LATERAL OVERLOADS [IZMENENIYE RITMIKI NEYRONOV RETIKULYARNOY FORMATSII PRI POPERECHNYKH PEREGRUZKAKH]

O. G. Gazenko et al Aug. 1964 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 155, no. 5 1964

(NASA-TT-F-230) OTS: \$0.50

Under lateral overloads the activity of individual neurons of the reticular formation changes in phases. The nature of this change is expressed at first in an increase in rhythm frequency—activation phase; then in the form of grouping of impulses—grouping phase; and finally in complete absence of activity—silent phase.

Author

N64-26836 National Aeronautics and Space Administration, Washington, D.C.

MICROBIOLOGICAL DEWAXING PROCESS YIELDING PROTEIN-VITAMIN CONCENTRATES

A. Champagnat, Ch. Vernet, B. Laine, and J. Filosa Aug. 1964 19 p refs Transl. into ENGLISH from Neftekhimiya (Moscow), v. 3, no. 5, 1963 p 799-810

(NASA-TT-F-233) OTS: \$0.50

Earlier research on the growth of microorganisms based on hydrocarbons bore the character of basic or academic research. The present investigation was basically undertaken from the industrial standpoint, with a view to the mass production of proteins from unrefined petroleum fractions, under technologically and economically feasible conditions. The dewaxing of these fractions is accomplished by fermentation, which has certain advantages.

Author

N64-26845 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.

EFFECTS OF SOME TRANQUILIZING, ANALEPTIC AND VASODILATING DRUGS ON PHYSICAL WORK CAPACITY AND ORTHOSTATIC TOLERANCE

R. V. Ganslen, B. Balke, F. J. Nagle, and E. E. Phillips Dec. 1963 10 p refs
(NIH G-6364)
(CARI-63-34)

Drugs for the control of psychosomatic disturbances have become so popular that their indiscriminate use could pose hazardous conditions in many facets of modern life requiring a high degree of mental alertness. In this study, attempts were made to explore the effects of one tranquilizing and two analeptic drugs on the physical working capacity and on cardiovascular responses to postural changes. A definite increase in work capacity was observed after ingestion of a combined caffeine-metrazol preparation, apparently resulting from an increased capacity for cardiac output and maximum oxygen intake. Recordil, a relatively new Italian drug and a very potent dilator of coronary arteries, also improved work capacity but caused a tendency for orthostatic syncope probably due to its generally vasodilating effects. The blood pressure depression observed with Equanil (from the meprobamate group) during rest, exercise, and tilting, especially with larger doses, raises the question about the safety of people engaged in the operation of aircraft or motor vehicles when sedated by this drug. Serious incidents and fatal accidents may be precipitated by the emotional indifference to suddenly arising problems or as a consequence of delayed circulatory responses during flight maneuvers. Author

N64-26852 Cincinnati U., Ohio Behavioral Sciences Lab.
A TEST OF TROUBLESHOOTING STRATEGY IN PAPER-PENCIL FORM

R. J. Senter and Frank Nairne Wright-Patterson AFB, Ohio, AMRL, Jul. 1963 9 p
(Contract AF 33(616)-7674; AF 33(616)-6835)
(AMRL-MEMO-P54; AD-417419)

As an adjunct to research on transfer of troubleshooting skill, a paper-and-pencil Troubleshooting Simulation Test (TST) was developed. This test was administered to subjects in an attempt to obtain validating data regarding the potential value of such tests for the selection of personnel most suited for learning to troubleshoot. The TST consisted of 13 items. Each item was composed of several (3 to 32) overlapping geometric figures. The points of union of the various figures were marked with an X. The subjects' task was to discover the mystery figure (known only to the experimenter) by sequentially selecting X's. A given figure could contain many X's, sharing each with different overlapping figures. The subject was informed whether or not the selected X was within the mystery figure. Performance on the TST correlated significantly with some measures of learning to troubleshoot some equipment. Support was evidenced for the concept of a paper-and-pencil simulation of troubleshooting test for selecting personnel for certain troubleshooting tasks. Author

N64-26874 Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Div.

THE EFFECT OF SIMULATED AIRCRAFT SPEED ON DETECTING AND IDENTIFYING TARGETS FROM SIDE-LOOKING-RADARIMAGERY Technical Documentary Report, Sep.-Dec. 1963

H. C. Self and Fen Rhodes May 1964 23 p refs
(AMRL-TDR-64-40; AD-603014)

Operator performance in detecting and identifying airfields, bridges, dams, and railroad yards from side-looking radar imagery was tested. The imagery was presented to four college students on a 14 by 14-in. screen at speeds representing Mach 0.9, 1.6, 2.3, and 3.1. An average of 65% of the targets was identified. Percentage of false targets varied significantly between subjects and ranged from 42% to 64%. A slight but consistent trend toward more detections at slower speeds was not found to be statistically significant. The number of false positive responses

was not significantly affected by image speed. No decrement in performance could be found as a result of extended (3 hours maximum) trial duration. Author

N64-26880 Joint Publications Research Service, Washington, D.C.

BIOLOGICAL EFFECTS OF GRAVITATIONAL ACCELERATION

Ye. A. Derevyanko and V. G. Mu'nikov 14 Aug. 1964 18 p
Transl. into ENGLISH of an Article from Voprosy Psikhologii (Moscow), v. X, no. 3, May-Jun. 1964 p 131-139
(JPRS-25929; TT-64-41200) OTS: \$1.00

The study of the gravitational-force effect on the pilot's biological mechanism is discussed as an index to information concerning the acceleration threshold. The tests were conducted in flight aboard a two-seater jet aircraft with the pilot enclosed in a cabin constructed from light material. In the range of g forces studied (0.8-1.2), the fundamental principle of stimulation, causing the appearance of acceleration sensations in man, is the process of change in the magnitude of g forces (gradient). The minimum gradient at which acceleration sensation appears is in a range from 0.01-0.02/sec. The latent period in which acceleration sensation appears is closely related to gradient. This relationship is expressed by an equation. The gradient of g forces from 0.01 to 0.02/sec gives the pilot information concerning the beginning of a change in the aircraft's position in space. A.L.B.

N64-26883 General Dynamics Corp., Groton, Conn. Electric Boat Div.

RESEARCH ON A WASTE SYSTEM FOR AEROSPACE STATIONS Technical Documentary Report, Apr. 1963-Jan. 1964

John Dodson and Harold Wallman Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., May 1964 81 p refs
(Contract AF 33(657)-11489)
(U413-64-056; AMRL-TDR-64-33; AD-603013)

An engineering evaluation was conducted to select an optimum waste management system for collection, storage, and/or disposal of feces and urine in a space station under weightless conditions. Based on this study, a detailed design of an optimum waste management system was prepared for a 7-man, 15-day mission. Tests performed on a breadboard model of the feces collector demonstrated the feasibility of the selected approach. Author

N64-26884 Radio Corp. of America, Princeton, N.J. RCA Labs.

TWO-MODE THRESHOLD LEARNING Technical Documentary Report, May 1963-Oct. 1963

J. Sklansky Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., May 1964 60 p refs
(Contract AF 33(657)-11336)
(AMRL-TDR-64-39; AD-602966)

In certain threshold learning processes (TLPs) associated with pattern recognition and sensory perception, the process of training an observer to recognize patterns or distinguish levels of sensory excitation may be modeled by a finite-state Markov chain. When the statistics of the signals received by the observer move at random between two sets of parameters, a two-mode TLP is obtained, modeled by a two-mode Markov chain. Using a probabilistic measure of effectiveness, the effectiveness of a simple incremental feedback policy is shown to be greater for two-mode TLPs than for one-mode TLPs over a certain range of environmental and structural statistics. A method of designing periodic train-work schedules for two-mode TLPs is described. (Train and work correspond to closed-loop and open-loop, respectively.) In many real adaptive processes an RC approximation of the train-work dynamics is applicable. For

these processes the ratio of working time to retraining time, yielding a desired performance level, is maximized when the work-retrain period is made as small as possible. Many stochastic processes present modeling problems of near psychological complexity. Ways in which open-loop-closed-loop relationships can help the life scientist or engineer model adaptive stochastic processes by two-mode TLP's are indicated. Author

N64-26892 Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

FURTHER EXPERIMENTS ON COMPUTER-AIDED LEARNING OF SOUND IDENTIFICATION

John A. Swets, Judith R. Harris, Linda S. Mc Elroy, and Harry Rudloe Apr. 1964 53 p refs

(Contract N61339-789)

(NAVTRADEVCE-789-2; AD-602076)

Earlier experiments on computer-aided teaching of the identification of nonverbal sounds showed an extremely simple procedure to be more effective than the procedures of automated or programed instruction. Specifically, a procedure in which the sound-label pairs are just presented and observed, in random order, was superior to procedures that employed various configurations of continual interrogation, overt response, immediate knowledge of results, presentation of items in a developmental order, and presentation of successive items conditional upon previous performance. Granting to the subject control of the training procedure led to no better final performance than that observed when the experimenter determined the course of the lesson, and the scope-and-light-pen device led to no better performance than the typewriter. Further analysis of the results provides detailed support of the earlier conclusions—for example, success was positively correlated with the proportion of time spent on simple exposure to the sound-label pairs, and negatively correlated with the proportion of time spent in active responding, receiving feedback, and making second tries. Three variables related to streamlining of the task and the temporal contiguity of sound and label account for nearly 100% of the variance. Author

N64-26905 Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Div.

PERFORMANCE PARAMETERS OF THE X-20 DYNA-SOAR PROTOTYPE FULL PRESSURE ASSEMBLY

Lee C. Rock May 1964 41 p refs

(AMRL-TDR-64-27; AD-603307)

The X-20 Dyna-Soar prototype model full pressure assembly was subjected to a series of tests to determine the performance parameters of the suit. These tests include those considered by Aerospace Medical Research Laboratories to be the basic standard performance tests for anthropomorphic protective assemblies in addition to those particularly requested by the Dyna-Soar Project Office. This report presents all the data obtained from the various tests and is presented as indicative of performance parameters only. No attempt was made to equate the assembly performance with the X-20 Dyna-Soar mission and vehicle performance or with the performance of any other anthropomorphic protective assembly. Author

N64-26906 Isomet Corp., Palisades Park, N.J.

CARBON DIOXIDE REDUCTION SYSTEM Technical Documentary Report Jan. 1962-Jan. 1964

H. Chandler Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., May 1964 62 p refs

(Contract AF 33(657)-8066)

(AMRL-TDR-64-42; AD-603357) OTS: \$1.75

An automatically operated carbon dioxide reduction system was developed, fabricated, and tested. The system was designed to reduce the carbon dioxide equivalent to that

produced by one man, and to produce carbon and oxygen. A system such as this is required for providing respiratory support for man on extended space missions. The program was conducted in three phases—development of system components, experimental determination of system design parameters, and fabrication and testing of an engineering model. Successful operation of the engineering model demonstrated the feasibility and ease of operation of the system. Recommendations are made for improving the system and for future work. Author

N64-26953 Massachusetts U., Amherst Inst. of Environmental Psychophysiology

VISUAL AFTER-IMAGES AS A SOURCE OF INFORMATION

Warren H. Teichner and Mahlon Wagner 11 Jun. 1964 45 p refs

(Contract N61339-1303)

(NAVTRADEVCE-1303-3; AD-603546)

The data-acquisition advantage afforded the human receiver by increasing the exposure time of briefly glimpsed, visual-display material is discussed. Under viewing conditions, the retinal afterimages of such material were found to add enough viewing time (about 10 to 15 seconds) to substantially improve the subjects report of what they had seen. For single glimpse situations, it is established that the observer sees more than he is able to report. The afterimage takes on two forms. Immediately following stimulation of the eye by the flashing of an image, there generally appears a positive afterimage that, in the absence of the stimulus, has the same contrast and color relations as the original image. The negative afterimage, which follows the positive, contains complementary color and has a much longer duration. J.L.C.

N64-26960 Hughes Aircraft Co., Culver City, Calif.

THE MEASUREMENT OF STIMULUS COMPLEXITY IN HIGH-RESOLUTION SENSOR IMAGERY

J. E. Nygaard, G. K. Slocum, J. O. Thomas, J. R. Skeen, and J. G. Woodhull Wright-Patterson AFB, Ohio, AMRL, May 1964 290 p refs

(Contract AF 33(657)-9477)

(AMRL-TDR-64-29; AD-603007)

A stimulus complexity analyzer was built and used to obtain measures of overall background complexity on several types of high-resolution reconnaissance imagery. These measures were then compared to target recognition performance in a series of studies using Side Looking Airborne Radar (SLAR), infrared (IR), and aerial photographic imageries. Significant relationships between a number of analyzer measures and recognition performance were obtained. For the photo and IR imagery backgrounds studied, a perfect curvilinear relationship was obtained between analyzer measures of total object count and recognition performance. Inverse relationships were obtained between target recognition time and mean object size and object size variance for the SLAR, IR, and photo backgrounds. These relationships were more obvious with the photo and IR imageries than with the SLAR imagery. Although these relationships should be considered tentative, they are encouraging. In addition to the development and experimental use of the stimulus complexity analyzer, a technique for embedding targets in different backgrounds was developed and used. It allowed the effects on performance of target differences, background differences, and target-by-background interaction to be studied. Author

N64-27036 National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF CORTISONE ON THE METABOLISM OF RIBONUCLEIC ACID AND ITS NUCLEOTIDES IN LIVER DEVELOPMENT (VPLIV KORTIZONU NA OBMIN RNK TA YY NUKLEYOTIDIV U PECHINTSI V ONTOGENEZE)

Ts. M. Shereshevskaya Aug. 1964 18 p refs Transl. into ENGLISH from Ukr. Biokhim. Zh. (Kiev), v. 35, no. 5, 1963 p 656-667

(NASA-TT-F-224) OTS: \$0.50

This investigation is concerned with the effect of cortisone on the content, qualitative composition, and metabolic rate of ribonucleic acid (RNA) and its individual nucleotides in the intact tissue and cell cytoplasm of the liver of white rats of different ages.

Author

N64-27055 Joint Publications Research Service, Washington, D.C.

STUDIES IN RADIO-PROTECTIVE ACTION OF GASES

V. P. Paribok, G. F. Krupnova, and V. S. Kal'niy 3 Aug. 1964 21 p refs Transl. into ENGLISH of 2 articles from Tsitologiya (Leningrad), v. 6, no. 2, 1964 p 162-167, 222-225

(JPRS-25703; TT-64-31975) OTS: \$1.00

Presented is a quantitative comparison of the antiradiation action of gases and low-molecular narcotics in cells of root meristem of bean sprouts. Concluded were the following: (1) Low-molecular narcotics, added to air, decrease oxygen-dependent radiation damage of the cell. (2) The protective action of low-molecular narcotics depends on their molecular volume; it decreases as the molecular volume increases. (3) Two hypotheses are offered to explain the obtained facts—persorption and diffusion. Also included in this report is the influence of cold and potassium nitrate on the antiradiation effect of compressed nitrogen. The following were concluded: (1) The lowering of temperature to 2°C or a 30-minute treatment of bean sprouts with cyanides suppresses the antiradiation action of compressed (to 20 and 25 atm) nitrogen. (2) It has been shown that the protective effectiveness of compressed nitrogen decreases with an increase of concentration of oxygen.

A.L.B.

N64-27057 Joint Publications Research Service, Washington, D.C.

CYBERNETICS AND THE DEVELOPMENT OF SCIENCES

E. A. Yakubaytis 4 Aug. 1964 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR (Riga), no. 12, 1963 p 24-26

(JPRS-25714; TT-64-31986) OTS: \$1.00

This article discusses the effects of the development of cybernetics and high-speed electronic machines on planning and management in the Soviet national economy. The history of mathematical logic as a science is reviewed, and the capabilities and applications of logic machines are generally described.

D.S.G.

N64-27059 Joint Publications Research Service, Washington, D.C.

ADVANCES IN AEROSPACE MEDICINE AND ANIMAL SYSTEMS IN BIONICS

V. V. Parin and M. A. Mil'khiker 6 Aug. 1964 16 p refs Transl. into ENGLISH from Priroda (Moscow), v. 53, no. 5, 1964 p 20-25, 33

(JPRS-25765; TT-64-41036) OTS: \$1.00

Bionics is one of the newest branches of cybernetics. The cybernetic approach to biological systems makes it possible to see those system characteristics that, when implemented mechanically, substantially accelerate scientific progress. This is shown by pointing to the high reliability of the nervous system of living organisms, to the uncommonly sensitive analyzer-analogs of data pickups in mechanical devices, and to the ultraminiature living "instruments" for precise orientation and navigation in sea turtles, fishes, birds, and insects.

Author

N64-27062 Joint Publications Research Service, Washington, D.C.

NUCLEIC ACIDS, AND VISUAL PERCEPTION: THREE STUDIES

10 Aug. 1964 25 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 155, no. 3, 1964

(JPRS-25824; TT-64-41095) OTS: \$1.00

Three studies are presented on nucleic acids and visual perception: (1) characteristics of R-RNA and D-RNA of the nucleochromosomal apparatus of an animal cell; (2) the role of DNA-dependent synthesis of RNA in the activation of the genetic apparatus of differentiated cells during an increase in their physiological function; and (3) synchronous and consecutive information processing in the visual system.

N.E.A.

N64-27066 Joint Publications Research Service, Washington, D.C.

ELEMENTS OF AUTOMATION IN MECHANICS OF INVESTIGATION OF HIGHER NERVOUS ACTIVITY

E. Frantik and M. Khorvat (Inst. of Labor Hyg. and Occupational Diseases, Prague) 12 Aug. 1964 9 p refs Transl. into ENGLISH from Zh. Vysshei Nervnoi Deyatel'nosti (Moscow), v. 14, no. 2, 1964 p 358-362

(JPRS-25861; TT-64-41132) OTS: \$1.00

Conditions for using automatic devices and systems in the study of higher nervous activity, and the inherent advantages and disadvantages are discussed on the basis of experience.

D.E.W.

N64-27071 National Aeronautics and Space Administration, Washington, D.C.

MEDICAL ASPECTS OF SPACE FLIGHT

Frank E. Voris [1964] 16 p

(EP-17) GPO: \$0.15

The following aspects of manned space flight are discussed: major human research problems, supplying respiratory requirements, problems of acceleration forces, problems of weightlessness, radiation hazards, space flight and nutrition, collection and disposition of bodily wastes, hazards of strike and penetration by meteoroids, and psychological problems.

R.T.K.

N64-27094 Kansas State U., Manhattan

THE EVOLUTION OF PERCEPTUAL FRAMES OF REFERENCE Technical Reports 17-20

William Bevan Apr. 1964 38 p refs

(Contract Nonr-3634(01))

(AD-600319)

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N64-27095 Kansas State U., Manhattan

ANCHOR EFFECTIVENESS AS A FUNCTION OF STIMULUS VARIATION ON AN INCIDENTAL DIMENSION

Joan Faye Pritchard and William Bevan In: The Evolution of Perceptual Frames of Reference Apr. 1964 9 p refs Submitted for Publication (See N64-27094 19-14)

(TR-17)

The study consisted of two experiments, A and B. Nine independent groups within each experiment judged a series consisting of a square and three rectangles as to their shape, the only dimension along which the series varied. A basic anchor group in each experiment, in addition, judged an anchor designate, which differed from its series members only in shape. Within each experiment the other seven anchor groups judged anchor designates identical in shape with the respective basic anchors but varying in size from the basic anchor. The size of these anchors were from one-half to four times the size of the basic anchor. A single control group served both experiments. Results for Experiment A indicated a U-shaped function for anchor potency as influenced by size of anchor. Maximum anchor effects were obtained in a region including the basic anchor and the one that was three times the size of the basic anchor. For Experiment B, in which the anchor shapes were selected to be more eccentric than those of A, the corresponding curve was complex. Maximal anchor effects were obtained with anchors 1/2 and 1 1/2 times the size of the basic anchor, the only one that failed to yield significant anchor effects. Author

N64-27096 Kansas State U., Manhattan
FORMS OF ORALLY-PRESENTED KNOWLEDGE OF RESULTS AND SERIAL REACTION TIME

Don Hardesty and William Beven *In its* The Evolution of Perceptual Frames of Reference Apr. 1964 7 p refs Submitted for Publication (See N64-27094 19-14) (TR-18)

The influence of differences in the form of orally presented knowledge of results upon serial reaction time to a visual signal was studied in four groups: a control group that received no knowledge of results, a group given actual reaction times in milliseconds, a group in which knowledge was provided through a monitor's comments of "very good" or "too slow," and a group receiving both types of reinforcement. The control group showed the usual decrement in performance over successive trials. All reinforcement groups displayed facilitated performance. While the group receiving quantitative information was not reliably superior to that receiving evaluative comment, the best performance was obtained in the group allowed both kinds of knowledge of results. Author

N64-27097 Kansas State U., Manhattan
VIGILANCE PERFORMANCE WITH A QUALITATIVE SHIFT IN REINFORCERS

William Bevan and Edward D. Turner *In its* The Evolution of Perceptual Frames of Reference Apr. 1964 8 p refs Submitted for Publication (See N64-27094 19-14) (TR-19)

The effect of shifting from positive to negative reinforcement, and the reverse, upon the detection of missing auditory signals was investigated. This experiment follows preliminary experiments with the serial learning of nonsense syllables, incidental memory for nonsense syllables, and visual monitoring. The present task was selected because it was of initial difficulty sufficient to allow for improvement in performance with reinforcement, and at the same time, yielded performance stable enough from trial to trial to allow for a competent estimate of the effect of temporal patterns of reinforcements. The subjects were 50 college students. Results are given for the performance on an auditory vigilance task, for the effect of reinforcement upon vigilance performance, and for performance under conditions of simple and changed reinforcement. R.T.K.

N64-27098 Kansas State U., Manhattan
TORQUE: A NEW DIMENSION IN TACTILE-KINESTHETIC SENSITIVITY

Burton Woodruff and Harry Helson *In its* The Evolution of Perceptual Frames of Reference Apr. 1964 8 p refs Submitted for Publication (See N64-27094 19-14) (TR-20)

Sensitivity to torque was measured by using a stimulus of constant weight that was manipulated to vary its torque according to its position on a rod. Five males were the subjects. Results of two experiments utilizing the method of constant stimulus differences and the comparative rating scale are reported. The Weber fraction for heavier judgments was found to be close to that reported for weight judgments, but that for lighter judgments was found to be considerably larger. Both the values of the adaptation levels and of the points of subjective equality indicated that negative time-order effect is operative in judgments of torque as well as in lifted weight judgments obtained by traditional methods. R.T.K.

N64-27125 Joint Publications Research Service, Washington, D.C.

INTRACARDIAC INVESTIGATION OF BLOOD PRESSURE AND PHONOCARDIOGRAM IN EXPERIMENT WITH NEW SOVIET APPARATUS

N. S. Dzhevadyan et al 13 Aug. 1964 6 p refs Transl. into ENGLISH Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 7, no. 2, 1963 p 78-80 (JPRS-25897; TT-64-41168) OTS: \$1.00

Results are presented of experiments on the functional characteristics of an attachment for registering intracardiac sounds and pressure, and also a precise definition of its circuit and construction. The POB-14 oscillograph was used for recording. Tests of the attachment were conducted on dogs—arterial and venous sounding of the heart through the jugular and femoral vein on the right, and through the carotid and femoral artery on the left. G.D.B.

N64-27138* National Aeronautics and Space Administration, Washington, D.C.

THE FUNCTIONAL CONDITION OF THE VESTIBULAR APPARATUS OF WHITE RATS ROTATING UNDER THE DAILY INFLUENCE OF ACCELERATION [O FUNKTSIONAL'NOM SOSTOYANII ORGANA RAVNOVESIYA U BELYKH KRYIS, VYRASHCHENNYKH V USLOVIYAKH EZHEDNEVNOGO DEYSTVIYA USKORENIY]

A. A. Gyurdzhian and Z. I. Apanasenko Jul. 1964 6 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 156, no. 1, 1964 p 225-227 (NASA-TT-F-9025)

From the second or third day of life, one half of a litter of rats were subjected to rotation for 4 to 5 hours daily, over a period of 2 to 3 months, on a special stand with a rotation radius of 135 cm., a speed of 33 rpm, and a radial acceleration of 2 g. The second half of the litter served as a control group. Rats reared under conditions of a prolonged daily action of acceleration show a characteristic vestibulotonic reaction. The electromyographic activity of the muscles of the experimental animals in a state of comparative rest is significantly lower than the electromyographic activity of the control animals under the same conditions. The reaction of the experimental group to vestibular stimulation is markedly weaker than in the control animals. R.T.K.

N64-27263 Army Biological Labs., Fort Detrick, Md.

RADIOLOGICAL SAFETY MANUAL
 A. G. Wedum Dec. 1963 88 p refs (AD-438147)

This manual was published for the use of personnel engaged in the use, handling, storage, or disposal of radioactive materials. General rules are given for surveys of radiation

areas, radiological safety instruction, and procurement of radioactive materials. Precautions necessary in the use of these materials, procedures in the event of accidents, and requirements of dosimetric methods are included. D.S.G.

N64-27264 Joint Publications Research Service, Washington, D.C.

ANTI-RAY EFFECT OF GALLATES UNDER CONDITIONS OF IRRADIATION WITH 1000 ROENTGENS

V. A. Baraboy 29 Jun. 1964 9 p refs Transl. into ENGLISH from Fiziol. Zh., Akad. Nauk Ukr. SSR (Kiev), v. 10, no. 1, 1964 p 89-93

(JPRS-25274; TT-64-31569) OTS: \$0.50

Mice were given 1000 r of irradiation, causing a severe form of acute radiation sickness that resulted in the death of all of the animals 8 to 10 days after irradiation. It was found that administration of cysteamine before irradiation had no significant effect on the course of radiation sickness. Administration of propyl gallate and sodium gallate before irradiation caused an increase in the average survival time of the mice. Propyl gallate and sodium gallate also caused a definite therapeutic effect when administered immediately after irradiation. Butyl gallate had no effect on the course of the radiation sickness. R.T.K.

N64-27284 California U., Los Angeles Brain Research Inst. **RESEARCH PERFORMED IN THE SPACE BIOLOGY LABORATORY** Final Report, 1 Jan.-31 Dec. 1962

[1962] 5 p refs

(Grant Nsg-203-62)

(NASA-CR-58038) OTS: \$1.10 ph

This is a review of several brain-research projects currently underway. A chimpanzee sleep program is described. Studies of centrifugal and vibrational stresses on brain electrical activity and concomitant behavioral performance are discussed. Presented are studies in monkeys of brain-wave patterns during exposure to cosmic rays at high altitudes. The development of EEG amplifiers for manned space flight, as well as the automatic reduction and computer analysis of EEG data are briefly summarized. G.D.B.

N64-27314 Republic Aviation Corp., Farmingdale, N.Y. Research Div.

BIOLOGICAL PASSIVE TELEMETRY

William M. Honig 30 Dec. 1963 37 p refs

(Contract NASw-789)

(NASA-CR-56942; RAC-1870; RD-P-63-586) OTS: \$3.60 ph

The main kinds of active and passive biological-telemetry schemes are described. A detailed examination of a scheme for passive biological telemetry is given. This method uses an implanted device that consists of an RF-tuned circuit. The resonant frequency of this circuit is controlled by the physiological parameter of interest, e.g., a temperature-sensitive capacitor (for temperature telemetry), a pressure-sensitive inductor (for pressure telemetry), or a voltage-sensitive capacitor (for biological-voltage telemetry). An external transmitter can be arranged to illuminate the implanted device with RF power; and in conjunction with an external receiver, the resonant frequency of the implanted device, or the points in time at which variations occur, can be determined. Factors affecting operation are examined, including RF attenuation in tissue, the types of fields that can be used, frequency considerations, coupling and directionality considerations, and techniques for the telemetry of biological voltage, temperature, pressure, and pH. The size of such a device and a discussion of the factors that might permit a reduction in this size also are given. Author

N64-27318 Joint Publications Research Service, Washington, D.C.

NORMAL SPATIAL VECTORCARDIOGRAM IN LABORATORY ANIMALS (DOGS, CATS, AND RABBITS) AND METHODS FOR ITS RECORDING

Ye. Kvintitskiy 27 Jul. 1964 11 p refs Transl. into ENGLISH from Fiziol. Zh., Akad. Nauk Ukr. SSR (Kiev), v. 10, no. 2, Mar.-Apr. 1964 p 177-182

(JPRS-25599; TT-64-31871) OTS: \$1.00

This work reports the results of an investigation of normal variations of VCG elements in 36 dogs, 20 cats, and 64 rabbits. VCG recording was carried out on animals in various positions and states. Vectorcardiograms were taken by means of three-plane systems, using a VEKS-3 or a Visocard-multi-vector apparatus. VCG recording was carried out several times on the same animal. The most typical curves encountered in laboratory animals are presented. The dog VCG diagram was closest to that of man. The most distinct VCG elements were obtained on recording of the curves with the animals in a standing position. Author

N64-27319 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF FRACTIONAL X-RAY IRRADIATION ON THE ACTIVITY OF HEXOKINASE AND ALDOLASE OF THE BRAIN AND MUSCLE TISSUE OF RATS

M. F. Silyayeva 29 Jul. 1964 17 p refs Transl. into ENGLISH from Vestsi Akad. Navuk Belarusk. SSR, Ser. Biyal. Navuk (Minsk), no. 1, 1964 p 101-106

(JPRS-25630; TT-64-31902) OTS: \$1.00

Total fractional X-ray irradiation of rats in doses of 120 and 240 r causes a considerable reduction of hexokinase activity in brain tissue in a period from 15 to 60 days following irradiation. In muscle tissue hexokinase reaction increased, with a maximum on the 30th day. Aldolase activity in the brain and cerebellum decreased within 15 and 60 days after irradiation. No change of aldolase activity took place in the muscles under the effect of fractional X-ray irradiation. The most significant changes in the activity of enzymes under study were found under fractional irradiation in doses of 240 r. Author

N64-27323 Joint Publications Research Service, Washington, D.C.

ACTION POTENTIALS OF VESTIBULAR NEURONS IN CATS

O. G. Gazonko, Yu. P. Limanskiy, A. N. Razumeyev, G. V. Izosimov, V. I. Baranov et al 13 Aug. 1964 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), No. 6, 1962 p 925-928

(JPRS-25896; TT-64-41167) OTS: \$1.00

The action potential of the neurons of the vestibular nuclei of the cat was recorded. The animal was in a state of immobility, and the reaction of the neurons to stimulation of the vestibular apparatus through passive vertical motion of the animal was obtained. Action potentials were recorded from 500 neurons of 17 different cats. R.T.K.

N64-27324 Joint Publications Research Service, Washington, D.C.

USE OF UREA FOR TREATMENT OF IMPAIRMENT OF THE EXCRETORY FUNCTION OF THE KIDNEYS IN BURNS

P. M. Fedonyuk 14 Aug. 1964 13 p refs Transl. into ENGLISH from Vestn. Khirurg. (Leningrad), v. 92, no. 5, May 1964 p 37-43

(JPRS-25928; TT-64-41199) OTS: \$1.00

A solution of urea, introduced intravenously or enterally in the first hours after burn, prevents the death of experimental

animals from burn shock and promotes removal of the sick from the state of burn shock. The medical action of urea in the initial period of burn illness is apparently connected with the fact that it depresses reabsorption of provisory urine in canaliculi, promoting an increase of urination. Therapy of acute kidney deficiency in the initial period of burn illness should be directed to the restoration of the quantity of liquid, circulating in vascular channel by means of hemotransfusion or abundant drink, and to weakening the reabsorption of provisory urine in the canaliculi of the kidneys by means of using osmotic diuretics, in particular, urea. The positive effect of the use of urea shows that the disturbances of the excretory function of kidneys in the initial period of burn illness in most cases have a reversible character. Author

N64-27335 Aerospace Industries Assn. of America, Inc., Washington, D. C. Aerospace Research and Testing Committee
RECOMMENDED SAFETY PRACTICES FOR MANNED SPACE CHAMBERS

Washington, Natl. Standards Assn., Jul. 1964 38 p refs
 (ARTC-41) Natl. Standards Assn.: \$1.50

Information is presented on materials and equipment to be used in the design and construction of space chambers, operating procedures, and information concerning the training of both operating personnel and test subjects. The appendixes included present specific background and supplementary information on engineering and biomedical terms, the personnel pressure suit, biomedical aspects of chamber design, and medical care of personnel suffering from exposure to a simulated space environment. R.T.K.

N64-27338 Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.

METABOLIC INTERCHANGES FOR MANNED SPACE FLIGHT

R. P. Cox 8 Apr. 1964 72 p refs
 (SM-45905)

The dietary essentials that constitute a complete diet for normal, healthy, young adult, human males as representative of the space crews are defined. Discussed is the chemical basis of the conversion of food into body energy, by the oxidation of the carbohydrates, fats, and proteins that comprise foodstuffs and that form heat and excretory waste products. From these criteria is derived a set of standard factors for use in calculating quantitatively the metabolic inputs and outputs of man. A series of tables, formulas, equations, and metabolic nomograms present weight and volume values for various ratios of digestible foodstuffs, water, oxygen, carbon dioxide, and metabolically produced water, and for human solid, liquid, and gaseous waste products. Author

N64-27340 Lockheed Missiles and Space Co., Sunnyvale, Calif.

IONIZING RADIATION EFFECTS ON PERFORMANCE CAPABILITIES OF ASTRONAUTS: AN ANNOTATED BIBLIOGRAPHY

Eugene E. Graziano, comp. Nov. 1963 41 p refs
 (Rept. 5-59-63-1; SRB-63-13; AD-441587)

This selective annotated bibliography consists of 82 references to literature specifically relating to ionizing radiation effects on human space travelers. Immediate and long-range effects on the eyes and other tissues vital to optimum performance capabilities were of special interest. Antiradiation drugs were also of interest. The period covered in the search was from January to November 1963. Author

N64-27343 California U., Los Angeles Laboratory of Nuclear Medicine and Radiation Biology

[RESEARCH PROJECTS IN BIOCHEMISTRY, RADIOBIOLOGY, PHARMACOLOGY AND TOXICOLOGY, NUCLEAR MEDICINE, BIOPHYSICS, AND ENVIRONMENTAL RADIATION] Semiannual Progress Report, Period Ending Jun. 30, 1964

[1964] 84 p refs
 (Contract AT(04-1)-GEN-12)
 (UCLA-12-529)

Summaries of publications or interim research reports by the staff of the Laboratory of Nuclear Medicine and Radiation Biology are presented. M.P.G.

N64-27351 Rocketdyne, Canoga Park, Calif.
SOURCES OF INFORMATION IN HUMAN FACTORS ENGINEERING

George A. Peters and Frank S. Hall 1 Jul. 1964 112 p refs
 (RH-3398-E)

This is a compilation of various publications related to all aspects of human-factors engineering, both military and commercial. The bibliography is divided into reference sources, regulatory and guidance documents, descriptive publications, and illustrative reports. G.D.B.

N64-27352 National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

ORGANIZATION OF THE DEOXYRIBONUCLEIC ACID REPLICATING SYSTEM IN MAMMALIAN CELLS AS REVEALED BY THE USE OF X-RADIATION AND BROMURACIL DEOXYRIBOSIDE

Robert B. Painter and Ronald E. Rasmussen Repr. from Nature, v. 201, no. 4915, 11 Jan. 1964 p 162-165 refs
 (NASA-RP-245)

Among the experiments conducted were ones in which the analog of thymidine, bromuracil deoxyriboside (BUDR), was incorporated into the DNA of the cells before irradiation. The results of this treatment suggested an interpretation of the dose-dependent depression of DNA synthesis rate by X-radiation and also suggested a hypothesis concerning the subchromosomal organizations of DNA. Two kinds of cell culture were used in these investigations, HeLa S3 and the Chinese hamster line, DFAF-33. Immediately after irradiation with either a 100 r/min or 300 r/min dose cultures including the sham-irradiated controls were returned to the laboratory, the media removed, and Eagle's medium containing the tracer added. Three different methods for DNA extraction were used and are described. The results of 14 experiments using $1\mu\text{C}/\text{ml}$ tritiated thymidine as the tracer for DNA synthesis in HeLa S3 cells are presented in graphic form. Graphs of the dose response of DFAF-33 DNA synthesis to X-radiation and the effect of BUDR on dose response of HeLa S3 DNA synthesis to X-radiation are presented and discussed. R.T.K.

N64-27367 National Aeronautics and Space Administration, Washington, D. C.

RADIOTELEMETRIC INVESTIGATION OF THE pH CONTENT IN THE ALIMENTARY CANAL [RADIOTELEMETRICHSKOYE ISSLEDOVANIYE pH V PISHCHEVARITEL'NOM TRAKTE]

Ye. B. Babitskiy, A. M. Sorin, A. S. Belousov, I. I. Malkiman, and A. P. Nesterova Jul. 1964 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 156, no. 1, 1964 p 222-224
 (NASA-TT-F-9026)

Studies were performed on man under clinical conditions. The subjects were usually healthy people but occasionally were patients. Either a radiocapsule that moved freely in the gastrointestinal tract, or a radiocapsule that was fastened to the end of a fine duodenal catheter was introduced into the alimentary canal. When the radiocapsule was attached to the catheter, it was possible to determine its location precisely and to detain it for awhile in one sector of the alimentary canal. Studies were carried out on an empty stomach and after the ingestion of food. When use was made of a radiopill moving freely in the alimentary canal, it was found that in normal subjects the gastric pH in an empty stomach and after the ingestion of food was within the range of 1 to 2; when the radiopill passed into the duodenum, the pH increased at once to 8 to 9; this value is steadily maintained along the entire small intestine. In the large intestine, the pH is often 5 to 6. Through the use of a radiocapsule attached to the end of the duodenal probe, studies were carried on with the introduction into the stomach of a definite amount of soda (0.5 g NaHCO_3 in 30 ml of water at a temperature of 38°C). Evidence is presented indicating that the introduction of a solution of soda can serve as a functional test of the intensity of secretion.

R.T.K.

N64-27369 National Aeronautics and Space Administration, Washington, D.C.

MORTALITY OF RAT FETUSES (F_1) AFTER IRRADIATION OF PARENTAL (P) GAMETES WITH SMALL DOSES OF X-RAYS DURING VARIOUS PERIODS OF THEIR ONTOGENESIS [SMERTNOST' ZARODYSHEY KRYSY (F_1) POSLE OBLUCHENIYA GAMET RODITELEY (P) V RAZNYYE PERIODY IKH ONTOGENEZA NEBOL'SHIMI DOZAMI RENTGENOVSKIKH LUCHEY]

Ye. A. Dozhidayev Jul. 1964 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 156, no. 1, 1964 p 194-197

(NASA-TT-F-9036)

The work was carried out on white rats. Parents of the generation being studied were subjected to the action of X-rays at different periods of the prenatal and postnatal life: fetuses at the ages of 10, 12, 13, 15, 17, and 19 days, and newly born and young rats at 7, 14, 30, and 45 days after birth. A single total irradiation was applied in each case. It was found that the action of X-rays is especially detrimental to the offspring of irradiated females. In comparison with the irradiation of females (oocytes), the irradiation of males (male gametes) in the same period of ontogenesis evokes far fewer disturbances of embryogenesis; however, in experimental irradiation of 10- and 19-day-old fetuses of newly born and of 7-day-old rats, the total mortality in the offspring from irradiation of males and females is approximately the same.

R.T.K.

N64-27385 Space Technology Labs., Inc., Redondo Beach, Calif.

STUDY OF MODEL MATCHING TECHNIQUES FOR THE DETERMINATION OF PARAMETERS IN HUMAN PILOT MODELS. REPORT ON TASK I LINEAR, TIME-INVARIANT MODELS

R. E. Humphrey, G. A. Bekey, R. E. Rose, and H. F. Meissinger [1963] 75 p refs

(Contract NAS1-2582)

(NASA-CR-56373; Rept. 8426-6002-RU-000) OTS: \$7.60ph

This report describes the results of an investigation of automatic computer techniques for determining the parameters of human pilot models in tasks where the pilot's performance can be described by a linear time-invariant model. Several model matching strategies including continuous and discontinuous, iterative schemes were developed, analyzed, and investigated experimentally, and their performance and

computer implementation were evaluated. Relative merits of these different methods were explored, and guide lines for future study were established to determine preferred model matching approaches. The methods reported were applied successfully to the determination of human pilot parameters in a single axis compensatory tracking task. Results are compared with those previously reported in the literature. Satisfactory agreement of data obtained from the different model matching techniques was demonstrated.

Author

N64-27395 California U., Los Angeles. Brain Research Inst. **EEG STABILITY ANALYSIS: SLEEP RECORDS**

Dan Brown and John M. Rhodes [1963] 21 p refs (Grants NsG-502; AF-AFOSR-246-63; NB-02501-03) (NASA-CR-56908) OTS: \$2.60

The concept of stability of EEG tracing is introduced as replicating one of the major factors used in clinically evaluating EEG records. Mathematical formulas for defining stability and theoretical behavior of deterministic and random processes are presented. Stability diagrams are given for typical distributions of bandwidth-duration relationships during an implanted chimpanzee sleep record, and for a group of electrode placements demonstrating separations of EEG patterns based, initially, on observed clinical categories.

G.D.B.

N64-27432 Magna Corp., Anaheim, Calif. Research and Development Div.

STUDY OF HYDROGEN-FIXING MICROORGANISMS FOR CLOSED REGENERATING BIOSYSTEMS

James H. Canfield and Max D. Lechtman Wright-Patterson AFB, Ohio, AMRL, Jun. 1964 98 p refs

(Contract AF 33(657)-9633)

(AMRL-TDR-64-35; AD-603595) OTS: \$2.25

The feasibility of using hydrogen-oxidizing bacteria in conjunction with electrolysis to regenerate oxygen and food-stuff from carbon dioxide and water was investigated. Results showed that 75 liters of *Hydrogenomonas eutropha* culture can fix the CO_2 and supply oxygen for one man. The cell yield is rich in proteins and deficient in carbohydrates and lipids for direct consumption by man. The feasibility of integrating the culture with the electrolysis was also investigated, with incompatibility of the bacteria with high salt content being the limiting factor. The ability of a hydrogen cathode to supply hydrogen to the culture was shown.

Author

N64-27433 Aerospace Research Labs., Wright-Patterson AFB, Ohio Behavioral Sciences Lab.

THE USE OF AUDITORY FEEDBACK IN SIMPLE REMOTE-HANDLING TASKS

William N. Kama, Louis T. Pope, and D. Frederick Baker May 1964 13 p ref

(AMRL-TDR-64-46; AD-603407)

A study was conducted to investigate the effect of auditory feedback upon performance of a remote handling task. Forty-five subjects, divided into three groups of 15 subjects each, used a Central Research Laboratory's model 8 master-slave manipulator to perform a simple remote handling task. One group performed the task under a no-sound condition; the second performed under a white-noise-only condition; the third group was provided with task-relevant auditory information. The results of this study suggest that, in the operation of this manipulator, supplementing visual, tactual, and proprioceptive information with task-relevant auditory information had little or no effect on performing simple remote handling tasks.

Author

N64-27444 Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Research Labs.
FINGER DEXTERITY OF THE PRESSURE-SUITED SUBJECT

Dieter E. Walk May 1964 15 p refs
 (AMRL-TDR-64-41; AD-603705)

This study attempts to establish an objective baseline for evaluating the functional mobility of pressure gloves. The Purdue Pegboard Dexterity Test was employed to measure hand dexterity under three conditions: (1) subjects barehanded, but wearing an unpressurized A/P-22S-2 full-pressure suit ensemble; (2) subjects gloved (HAK-3/P-22S-2) and suited, but not pressurized; (3) subjects gloved, suited, and pressurized to 2.5 psi. The Purdue Pegboard Dexterity Test is a delicate indicator of hand dexterity in the test conditions. The test results show a marked reduction in dexterity even with the gloves and suit uninflated, and an additional loss when gloves and suit were inflated. The degree of loss of dexterity is believed to provide an objective measure whereby one operational aspect of pressure gloves may be evaluated. Author

N64-27445 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio
TIME HISTORY AS AN INFORMATION SOURCE FOR OPERATOR CONTROL OF ORBITAL RENDEZVOUS Technical Documentary Report, Jan.-Mar. 1964

William K. Mc Coy, Jr. (Ritchie and Associates, Inc.) and George G. Frost Jun. 1964 34 p refs Prepared Jointly with Ritchie and Associates, Inc.
 (NASA Order W-11615-B; Contract AF 33(615)-1089)
 (AMRL-TDR-64-55; AD-603597)

A study of operator performance in an orbital rendezvous task was conducted to evaluate a display of the orbit plane (X-Y plane) for rendezvous and to determine the effects of presenting a time history of the rendezvous as an aid to the operator. The system dynamics were simulated on an analog computer, and an X-Y plotter was used as the display system. Total ΔV expended and frequency and magnitude of control movements were used as performance indices. Range and range rate less than 10 ft (3.05 m) and 0.5 fps (0.15 m/sec), respectively, were used as criteria of successful rendezvous. Subjects were instructed to use the two-impulse orbital transfer technique. Subjects were able to rendezvous successfully both with and without the time history information, thus demonstrating that the orbit plane profile display was satisfactory. The addition of time history information resulted in significantly lower ΔV 's than those obtained without the time history. Author

N64-27493 Minnesota U., Minneapolis
THORACIC CAGE IMPEDANCE MEASUREMENTS. IMPEDANCE PLETHYSMOGRAPHIC DETERMINATION OF CARDIAC OUTPUT (AN INTERPRETIVE STUDY)

Edwin Kinnen, William Kubicek, and D. Witsoe Brooks AFB, Tex., School of Aerospace Med. May 1964 16 p refs
 (Contract AF 41(657)-403)
 (SAM-TDR-64-23; AD-603053)

The current flux distribution in the human thorax between band electrodes placed at the base of the neck and around the lower thorax, using 100-kc excitation, was investigated to explain known correlations between the thorax electrical impedance waveforms and cardiac activity, particularly cardiac output. Measurements of the current densities around the band electrodes, equipotential surfaces constructed from both surface and interior potential measurements, externally observed directed flux impedance waveforms, and impedance properties of an approximate thorax model indicated that the major portion of electrode current flux passed through the lung

tissues rather than through the blood volumes of the heart having lower resistivity. The impedance plethysmographic waveforms, obtained between the band electrodes, appeared to monitor the right ventricular stroke volume as reflected by impedance changes in the pulmonary vascular bed. Author

N64-27494 Boeing Co., Seattle, Wash.
THE EFFECTS OF MISCELLANEOUS WASTES ON MESOPHILIC ACTIVATED SLUDGE CELLULOSE

R. W. Okey, R. L. Cohen, and D. D. Chapman Brooks AFB, Tex., School of Aerospace Med. May 1964 12 p refs
 (Contract AF 41(657)-387)
 (SAM-TDR-64-25; AD-603055)

A broad spectrum microbial culture similar to activated sludge in utilizing cellulose has been evaluated for its ability to utilize wastes. The metabolism of cellulose was followed in Warburg and substrate depletion studies by utilizing measurements of chemical oxygen demand. Activated sludges were developed on cellulose as a sole carbon source and on human waste with added cellulose designed to simulate the waste that would be received in a remote environment. From the Warburg and substrate depletion studies, constants of first-order oxidation rate were obtained. The first-order oxidation constants were found to vary between 0.0133 and 0.0146 reciprocal hours. It was observed that a lag period varying from 400 to 1,500 minutes preceded the utilization of cellulose by the microbial system. Author

N64-27501 Joint Publications Research Service, Washington, D.C.

INFLUENCE OF GRAVITATIONAL OVERLOADS ON THE ARTERIAL SYSTEM OF THE EXTREMITAL NERVES

V. A. Otellin 29 Jun. 1964 9 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. i Embriol. (Moscow), v. 46, no. 4, 1964 p 87-92
 (JPRS-25275; TT-64-31570) OTS: \$0.50

The successive changes that occur in the neural arterial system of the polarly oriented extremities, after exposure to gravitational overloads in different directions, are studied. It was shown that the greatest changes in the neural arterial system occur when the gravitational overloads are directed along the head-pelvis axis, and the smallest changes occur when they are directed along the transverse (chest-back) axis. Overloads in the head-pelvis direction lead to dilatation of all links in the arterial system of the nerves of the hind legs, as well as to the appearance of a larger number of vessels. Obliteration of the blood vessels occurs in the foreleg. These changes have a reversible character. Exposure to daily overloads of increasing amplitude in the head-pelvis direction leads to an increase in the capacity of the arterial channel of the nerves of the extremities. The effect of overloads on the arterial system of the perineurium, endoneurium, and epineurium is also considered. N.E.A.

N64-27503 Joint Publications Research Service, Washington, D.C.

STUDIES IN HYPERTHEMIA AND ANABIOSIS

Ye. V. Maystrakh 30 Jul. 1964 24 p Transl. into ENGLISH of portions of the book "Gipotermiya and Anabioz", Moscow, 1964 p 3-23, 285-288 refs
 (JPRS-25650; TT-64-31922) OTS: \$1.00

Questions pertaining to the problem of cold inhibition and cessation of vital activity in the organs of nonhibernating mammals are considered. The role of nervous mechanisms in cold suppression of vital activity was the main analysis. The influence of hypothermia on pathological processes was investigated in an effort to determine those shifts in a cooled organ that insured its increased resistance to pathogenic stimulation. N.E.A.

N64-27513 California U., Berkeley Donner Lab. of Medical Physics

HEAVY ION LOCALIZATION OF SENSITIVE EMBRYONIC SITES IN *TRIBOLIUM*

John V. Slater, John Lyman, C. A. Tobias, N. M. Amer, J. S. Beck et al. Repr. from Radiation Res., v. 21, no. 4, Apr. 1964 p 541-549 refs

(NASA Order R-104)

The Berkeley heavy-ion linear accelerator was used to demonstrate that two relatively shallow sensitive sites exist in *Tribolium* that regulate wing differentiation and development. Both of these sites appear to have the same intensity and may lie within the membranous wing-base areas. It was found that, as in mice, the developmental interval during which radiation must be applied to give the greatest incidence of the malformation is restricted to a very short time period. R.T.K.

N64-27604 Army Cold Regions Research and Engineering Lab., Hanover, N.H.

OPERATOR VARIANCE IN THE DETERMINATION OF THE PLASTIC LIMIT

G. E. H. Ballard and W. F. Weeks Sep. 1963 13 p refs

(Contract DA-11-190-ENG-64)

(RR-117; AD-433188)

An experiment was designed to investigate operator variance in the determination of the plastic limit of cohesive soils, independent of sample preparation and hydration time. A standard sample was prepared by dry-mixing commercial clay, Grundite, with a pure silt. After the sample was hydrated for 3 weeks, five random samples were taken, and five replicates were performed on each sample. Analysis of variance (AOV) shows that there is no reason to doubt that the sample is homogeneous at the 0.05 level of significance. Random samples were then distributed to five zones of operators, where a zone is defined as a group of operators with similar backgrounds and engineering interests. Two operators from each group performed five replicates. The major factor contributing to the total sample variance is the inconsistency between the individual operators who, although able to duplicate their own determinations, do not call the same end point. Author

N64-27630 Joint Publications Research Service, Washington, D.C.

BIOLOGICAL STUDIES UNDER CONDITIONS OF SPACE FLIGHT AND WEIGHTLESSNESS

11 Aug. 1964 71 p refs Transl. into ENGLISH of 4 Articles from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 3, May-Jun. 1964 p 341-387

(JPRS-25844; TT-64-41115) OTS: \$3.00

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2. BLOOD CIRCULATION UNDER CONDITIONS OF WEIGHTLESSNESS I. I. Kas'yan et al p 16-41 refs (See N64-27632 19-16)

3. SENSITIVITY OF VESTIBULAR ANALYZERS AND SENSORY REACTIONS IN MAN DURING BRIEF WEIGHTLESSNESS Ye. M. Yuganov et al p 42-51 refs (See N64-27633 19-16)

4. APPLICATION OF POLAROGRAPHIC METHOD OF DETERMINATION OF OXYGEN TENSION IN TISSUES OF BRAIN DURING HIGH-ALTITUDE FLIGHT Ye. A. Kovalenko et al p 52-68 refs (See N64-27634 19-16)

N64-27631 Joint Publications Research Service, Washington, D.C.

CERTAIN RESULTS OF AND LONG-TERM PROSPECTS FOR THE DEVELOPMENT OF RADIOBIOLOGICAL RESEARCH IN SPACE

N. M. Sisakyan, V. V. Parin, V. V. Antipov, N. N. Dobrov, and P. P. Saksonov *In its Biol. Studies under Conditions of Space Flight and Weightlessness* 11 Aug. 1964 p 1-15 refs Rept. on the Sixth Intern. and Twelfth European Congr. of Aviation and Space Med., Rome, 1-5 Oct. 1963 (See N64-27630 19-16) OTS: \$3.00

The results of various studies of the radiobiological effects of space flight are reviewed. Both actual flight and laboratory investigations of the relative biological effectiveness of protons and heavy nuclei of different energies, of the combined action of these particles with other space flight factors, and of the development of effective physical, biological, and pharmacological means of protection are included. The need for further studies is indicated, and the directions such studies should take are suggested. M.P.G.

N64-27632 Joint Publications Research Service, Washington, D.C.

BLOOD CIRCULATION UNDER CONDITIONS OF WEIGHTLESSNESS

I. I. Kas'yan, V. I. Kopanov, and V. I. Yazdovskiy *In its Biol. Studies under Conditions of Space Flight and Weightlessness* 11 Aug. 1964 p 16-41 refs (See N64-27630 19-16) OTS: \$3.00

Results of numerous studies of the effects of weightlessness during suborbital and orbital space flight on the cardiovascular systems of men and animals are reviewed. The following conclusions are presented: (1) No essential disturbances of blood circulation result from flights in near space. (2) Experimental subjects can be divided into groups according to their pulse rate and arterial pressure response to weightlessness during flights of up to 5-days duration. (3) Changes in pulse rate and arterial pressure can be attributed to significant lowering of the hydrostatic pressure of the blood (direct influence of weightlessness) and also to disturbance of functional analyzer systems (indirect influence of weightlessness). M.P.G.

N64-27633 Joint Publications Research Service, Washington, D.C.

SENSITIVITY OF VESTIBULAR ANALYZERS AND SENSORY REACTIONS IN MAN DURING BRIEF WEIGHTLESSNESS

Ye. M. Yuganov, I. A. Sidel'nikov, A. I. Gorshkov, and I. I. Kas'yan *In its Biol. Studies under Conditions of Space Flight and Weightlessness* 11 Aug. 1964 p 42-51 refs (See N64-27630 19-16) OTS: \$3.00

The value of ground-based vestibulometry methods in determining the sensitivity of human subjects to the labyrinthine effects of weightlessness (salivation, nausea, vomiting, etc.) is discussed. Two tests were found to give the most useful prognostication of the efficiency of the subject during periods of brief weightlessness: (1) the cumulation of Coriolis acceleration test and (2) the inhibition of labyrinthine reaction test. Both of these test methods are described in detail, and subjects are classified into three groups according to their degree of labyrinthine stability under weightlessness. M.P.G.

N64-27634 Joint Publications Research Service, Washington, D.C.

APPLICATION OF POLAROGRAPHIC METHOD OF DETERMINATION OF OXYGEN TENSION IN TISSUES OF BRAIN DURING HIGH-ALTITUDE FLIGHT

Ye. A. Kovalenko, V. L. Popkov, and I. N. Chernyakov *In its Biol. Studies under Conditions of Space Flight and Weightlessness* 11 Aug. 1964 p 52-68 refs (See N64-27630 19-16) OTS: \$3.00

The usefulness of polarographic analysis in determining the variations of oxygen tension in the brain tissue of dogs undergoing the various hypoxic states commonly associated with high-altitude flight was investigated. Variations in oxygen tension were established, using hard platinum electrodes and continuous recording techniques, for the following conditions: compositional changes in the inhaled air, breathing of pure oxygen as opposed to air mixtures during rapid ascent to 12 km, descent and associated decompression, acceleration, and breathing oxygen under excess pressure in the lungs. M.P.G.

N64-27636 Joint Publications Research Service, Washington, D.C.

DETECTION OF LABELLED RIBONUCLEIC ACID IN THE NERVOUS SYSTEM OF WHITE RATS

N. D. Gracheva 20 Aug. 1964 18 p refs Transl. into ENGLISH from *Arkh. Anat., Gistol. i Embriol.* (Moscow), no. 5, May 1964 p 3-11 (JPRS-26042; TT-64-41312) OTS: \$1.00

It was shown autoradiographically that the most intensive synthesis of RNA in the nerve cells of the central and peripheral sections of the nervous system occurred in the nucleolus and the chromatin and was preceded by the appearance of labelled RNA in the cytoplasm. In the central and peripheral sections of the nervous system the labeling of the RNA of the nerve cells after the subcutaneous introduction of radioactive predecessors occurred unequally. In morphologically simple nerve cells the synthesis of RNA did not occur synchronously, apparently as a result of their different functional state. Author

N64-27649 Naval Radiological Defense Lab., San Francisco, Calif.

CHROMOSOME ABNORMALITIES IN LIVER AND MARROW OF MICE IRRADIATED WITH FAST NEUTRONS, GAMMA-, AND X-RAYS. EFFECT OF DOSE RATE

P. C. Nowell, D. Craig, F. Matthews, and L. J. Cole 21 Apr. 1964 29 p refs (USNRDL-TR-740; AD-601115)

Low dose-rate irradiation, with either gamma-rays or fast neutrons, resulted in fewer chromosome abnormalities in liver and bone marrow than did comparable high dose-rate irradiation with X-rays or neutrons. Neutrons generally produced more aberrations than the low LET radiations, but a dose-rate effect was apparent with both types of radiation. Unstable chromosome aberrations, as well as total aberrations, were reduced in the low dose-rate groups, giving evidence of the action of an intracellular repair process. For both technical and theoretical reasons, the liver and bone marrow are not ideal systems for quantitative studies of the effects of ionizing radiation on mammalian chromosomes. In a few mice, the clonal chromosome changes provided a means of identifying myeloid cells in the liver preparations. Dividing diploid cells in both the marrow and liver showed the same chromosome change and apparently were derived from a common radiation-damaged ancestor. Author

N64-27668 Joint Publications Research Service, Washington, D.C.

UTILIZATION OF ENZYMES FOR THE DETECTION OF BIOLOGICALLY HARMFUL AGENTS

A. A. Pokrovsky 19 Aug. 1964 11 p refs Transl. into ENGLISH from *Voprosy Med. Khim.* (Moscow), v. IV, no. 6, Jul.-Aug. 1958 p 292-297 (JPRS-25986; TT-64-41257) OTS: \$1.00

Insecticides are detected according to the suppression of the activity of cholinesterase. To do this, a standard cholinesterase preparation is brought into contact with substances suspected of contamination (water, food, air, etc.), and a comparison is made of enzyme activity before and after contact. A sharp decline of activity as a result of contact is a proof of the presence in the substance of toxicity. The determination of the activity is made by a simple colorimetric method using bromthymol blue. Graphs are given for various activity magnitudes. A.W.

N64-27669 Joint Publications Research Service, Washington, D.C.

THE CONCEPT OF INFORMATION IN THE LIGHT OF LENIN'S THEORY OF REFLECTION

N. I. Zhukov 20 Aug. 1964 14 p Transl. into ENGLISH from *Voprosy Filosofii* (Moscow), No. 11, 1963 p 153-161 (JPRS-26012; TT-64-41282) OTS: \$1.00

Cybernetics are philosophically discussed in terms of Communist theory. The Soviet terminology used in information and control theory, especially when related to writings of Party theoreticians, is highly specialized. G.D.B.

N64-27670 Joint Publications Research Service, Washington, D.C.

RESULTS OF MICROWAVE TREATMENT OF SOME DISEASES

L. Nikolova-Troyeva 20 Aug. 1964 7 p ref Transl. into ENGLISH from *Vopr. Kurortol., Fizioterapii i Lecheb. Fiz. Kul't.* (Moscow), v. 29, no. 3, May-Jun. 1964 p 239-242 (JPRS-26038; TT-64-41308) OTS: \$1.00

Microwave therapy produces good results in cases of postoperative infiltrates, myalgias, acute suppurative maxillary sinusitis, furuncles in the region of the face, arthritis deformans, and spondylarthritis and other diseases. When indicated, the combination of microwave therapy with other physical methods (therapeutic exercises, erythema doses of ultraviolet) or with medication accelerates the healing process and reinforces the therapeutic effect. Author

N64-27671 Joint Publications Research Service, Washington, D.C.

MATERIAL ON HYGIENIC CHARACTERISTICS OF INDUSTRIAL RHENIUM AEROSOL

S. V. Suvorov 21 Aug. 1964 9 p refs Transl. into ENGLISH from *Gigiena Truda i Prof. Zabolevaniia* (Moscow), v. 7, no. 6, Jun. 1964 p 10-13 (JPRS-26069; TT-64-41339) OTS: \$1.00

Metallic rhenium dust produces no intoxication, but when introduced intratracheally it leads to the development of a mild fibrosis in the lungs of experimental animals. Rhenium condensation aerosol, in a single action involving large concentrations in the atmosphere (20 mg per cubic meter), causes acute intoxication. Animals exposed to the prolonged effect of rhenium condensation aerosol in small concentrations (6 mg per cubic meter) show mild signs of intoxication (increase of amino acid content in the urine, and depression of phosphatase activity). Metallic rhenium dust does not differ in its effect from that of wolfram dust, and therefore its maximum permissible concentration in the atmosphere may be established at the same level as for wolfram. Author

N64-27693 State U. of New York at Buffalo
NEUROLOGIC ASPECTS OF HIGH BAROMETRIC PRESSURE PHENOMENA AND THE EFFECT OF ATMOSPHERIC CONTAMINANTS UPON NERVOUS SYSTEM ACTIVITY
Final Report, 1 Nov. 1959-31 Dec. 1963

H. William Gillen et al [1963] 5 p refs
(Contract Nonr-969(04))
(AD-600259)

Rats and mice were exposed to mixtures of 35% carbon dioxide and 65% oxygen for varying periods of time. The electroencephalogram, electrocardiogram, and respiratory rate were recorded before, during, and after the exposures. The mixed venous blood, cerebral cortex, cardiac muscle, liver, and skeletal muscle were analyzed for sodium, potassium, chloride, water, carbon dioxide, phosphorous, calcium, magnesium, glucose, hydrogen ion concentration, and adenosinetriphosphate. Several series of animals were pretreated with acetazolamide (carbonic anhydrase inhibitor), THAM buffer, or isotonic saline. Oxygen-poisoning studies were also conducted in which rats were used exclusively. Extensive tests were made to determine the susceptibility of unanesthetized, unrestrained rats to oxygen poisoning as manifested by convulsions at different pressures. R.T.K.

N64-27797 Florida State U., Tallahassee Inst. for Space Biosciences

EXPERIMENTS SUGGESTING ORIGINS OF AMINO ACIDS AND PROTEINS

Sidney W. Fox Repr. from Symp. on Protein Nutr. and Metab., Spec. Publ. No. 4, III. U. Coll. of Agr., Urbana, Oct. 1963 14 p refs *Its Contrib. No. 6* Previously Published as N63-11402 03-16
(Grants NsG-173-63; NIH-C-3971)

The ways in which amino acids have been produced under presumably primordial conditions are discussed. The results with amino acids first demonstrated that highly complex macromolecules can arise from relatively simple micromolecules. Results with nucleotides suggest a similar relationship. Results of experiments with amino acids and proteins are used to suggest a hypothesis whereby units as complex as primitive cells could arise. R.T.K.

N64-27799 California U., Berkeley Lawrence Radiation Lab. Donner Lab.

BIOLOGY AND MEDICINE SEMIANNUAL REPORT, SPRING 1964

John H. Lawrence, ed. and Tove Neville 1964 172 p refs
(Contract W-7405-ENG-48)
(UCRL-11387) OTS: \$2.75

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17. STUDIES ON CHROMOSOMES BY MEANS OF SHORT-TERM LYMPHOCYTE CULTURE William D. Loughman, H. Saul Winchell, and Myron Pollycove p 165

N64-27817 Martin Co., Baltimore, Md.
CHEMOSYNTHETIC GAS EXCHANGER Final Report, Jun. 1963-Jun. 1964

Leonard Bongers Jul. 1964 52 p refs
(Contract NASW-713)

(NASA-CR-58129; ER-13270-4) OTS: \$5.60 ph

This report presents results of investigations that had as main objectives the study of physiological growth requirements and limitations of *Hydrogenomonas eutropha*. The research was directed toward the discovery of optimal conditions of growth of this organism in relatively densely populated inorganic media. Growth characteristics studied were the effect of temperature, the formation of metabolic products, the efficiency of energy conversion, and the effects of the gaseous and the inorganic substrates. Author

N64-27840 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

A METHOD OF CONTINUOUS REGISTRATION OF LOCAL CEREBRAL BLOOD FLOW IN ACUTE AND CHRONIC EXPERIMENTS

D. I. Parolla 28 Apr. 1964 5 p refs Transl. into ENGLISH from Vopr. Fiziol. i Patol. Nervnoi Sistemy, Inst. Fiziol., Akad. Nauk SSSR (Moscow), 1958 p 123-125

(FTD-TT-63-1175/1+2+4; AD-600825) OTS: \$0.50

A thermistor was used for registering blood flow. The power supply to the bridge, one of the legs of which is a thermoelectrode, is increased and the thermistor (which has a low power supply) then heats. The simplicity of the attachment

permitting regulation of power supplies to the bridge, and the significant gain in sensitivity (sixfold or more) in registering blood flow by thermoresistance are the advantages of this method. A.W.

N64-27844 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

IN A HEALTHY BODY, A HEALTHY SPIRIT

N. Filimonov 26 May 1964 6 p Transl. into ENGLISH from Med. Gazeta (USSR), 21 Jun. 1963 p 4

(FTD-TT-64-258/1+2+4; AD-602375) OTS: \$0.50

This is a brief account of the physical effects of weightlessness on a cosmonaut. To prevent weakness from lack of mobility within the spaceship and from the weightless condition itself, Soviet scientists propose two remedies: (1) a special suit with numerous rubber bladders alternately inflated with air and squeezing upon some part of the body; and (2) a special complex of physical exercises for the muscles. A.W.

IAA ENTRIES

A64-21731

ON THE INFORMATION RATE OF PITCH SIGNALS.

H. L. Shaffer and L. Dolansky (Northeastern University, Boston, Mass.).

(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 23-26, 1964.)

IEEE International Convention Record, vol. 12, pt. 6, 1964, p. 297-304. 36 refs.

Study of factors determining the channel capacity needed for the adequate transmission of the pitch signal of a spoken message. Using information theory, the rate at which the pitch signal provides information is studied, taking into account information on the past history of the signal. Required channel capacities are calculated.

A64-21862

THE DYNAMICS OF RETRIEVAL OF TETHERED ASTRONAUTS.

Gary P. Beasley, Roy F. Brissenden (NASA, Langley Research Center, Space Mechanics Div., Guidance and Control Branch, Hampton, Va.), Warren H. Straly (Marquardt Corp., Advanced Aerospace Systems, Van Nuys, Calif.), and Robert W. Adlhoeh (Marquardt Corp., Van Nuys, Calif.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-393. 18 p. Members, \$0.50; nonmembers, \$1.00.

Qualitative examination of the general restrained rendezvous (tethered retrieval) problem of two- and three-body systems in orbit, employing a physical link between the bodies in question. The particular case considered assumes that the link is a flexible cable and that the objects to be joined are an astronaut and his space vehicle. The angular momentum is assumed to be contained largely in the retrieved body by virtue of its velocity and large displacements from the system mass center. It is seen that the astronaut operational envelope defines the magnitude of the retrieval problem and that the primary consideration is the angular momentum of the orbiting system. Generally, retrieval philosophies which do not conserve this angular momentum must be adopted. The requirements for the implementation of a mechanical system for routine or emergency retrieval operations are discussed. It is shown that constant tension techniques do not lend themselves to efficient retrieval. Various techniques are discussed for judicious use of line tension to allow partial reel-in and circularization of the tethered mass for retention and capture. A system which provides momentum dissipation during retrieval is shown to be the most satisfactory, and one which uses thrust applied at the smaller mass is more efficient. It is briefly shown that the use of a third mass beyond the tethered mass for absorbing momentum is promising.

A64-22002

GETTING OUT ALIVE - AIRLINER EMERGENCY-EXIT REQUIREMENTS.

Molly Neal.

Flight International, vol. 85, June 18, 1964, p. 1005-1009.

Presentation of design requirements for airworthiness certification. Special consideration is given to regulations concerning emergency exits. The US and the British requirements are compared and, for the most part, found similar. Emergency exit requirements for the various designs now in commercial use are discussed. The evacuation tests reviewed by the FAA and the evacuation tests carried out by BOAC and BUA are considered.

A64-22053

PHYSIOLOGIC RESPONSE TO INCREASED OXYGEN PARTIAL PRESSURE. I - CLINICAL OBSERVATIONS.

James E. Herlocher, David G. Quigley, Victor S. Behar, E. G. Shaw, and B. E. Welch (USAF, School of Aerospace Medicine, Environmental Systems Branch, Brooks AFB, Tex.).

Aerospace Medicine, vol. 35, July 1964, p. 613-618. 12 refs. NASA Defense PR No. R-89; PR No. T-16758-G.

Discussion of two human experiments conducted to determine the clinical effects of a 30-day exposure to an atmosphere which provides an alveolar oxygen partial pressure of approximately 170 mm Hg. The effects of nitrogen in this atmosphere are investigated by conducting one experiment with a nitrogen partial pressure of approximately 0.5 mm Hg, and the other experiment with a nitrogen partial pressure of approximately 436 mm Hg. The alveolar gas exchange equation was used to calculate the percentage of oxygen needed to produce the desired alveolar oxygen partial pressure. The experiments show that the described atmospheres are well tolerated by the young subjects, who demonstrate very few of the previously described symptoms of oxygen toxicity. The aural atelectasis and nasal congestion are bothersome but do not interfere with mission completion. This is the only area where the presence or absence of nitrogen made a noticeable difference. Dark-adaptation studies and renal function measurements fail to outline any decrease in function, either at 700 mm Hg or 258 mm Hg. The use of a single gas, 258 mm Hg P_T atmosphere seems to be feasible for periods up to 30 days without any impairment of man's ability to carry out his duties or without creating any physiological decrement.

A64-22054

PHYSIOLOGIC RESPONSE TO INCREASED OXYGEN PARTIAL PRESSURE. II - RESPIRATORY STUDIES.

William G. Robertson, John J. Hargreaves, James E. Herlocher, and B. E. Welch (USAF, School of Aerospace Medicine, Environmental Systems Branch, Bioastronautics Dept., Brooks AFB, Tex.). Aerospace Medicine, vol. 35, July 1964, p. 618-622. 16 refs. NASA Defense PR No. R-89; PR No. T-16758-G.

Discussion of the respiratory response to an experimental 30-day exposure to an alveolar partial pressure of 171 mm Hg at a total pressure of 700 mm Hg (33.3% O_2) and at 258 mm Hg (100% O_2). Vital capacities decrease on ascent to the 258 mm Hg pressure altitude and return to normal immediately upon descent to ground level. Maximum breathing capacities increase concomitantly. No changes are seen at the 700 mm Hg exposure. There is no evidence of changes in the oxygen carrying capacity of the blood. The lack of any persistent, unaccountable effects of an alveolar partial pressure of 171 mm Hg in the presence or absence of nitrogen indicates that as far as pulmonary function is concerned, man appears to be able to tolerate either environment equally well.

A64-22055

PHYSIOLOGIC RESPONSE TO INCREASED OXYGEN PARTIAL PRESSURE. III - HEMATOPOIESIS.

Ralph Zalusky, Frode Ulvedal, James E. Herlocher, and B. E. Welch (USAF, School of Aerospace Medicine, Environmental Systems Branch, Brooks AFB, Tex.). Aerospace Medicine, vol. 35, July 1964, p. 622-626. 22 refs. NASA Defense PR No. R-89; PR No. T-16758-G.

Discussion of the erythropoiesis response to an experimental 30-day exposure to an atmosphere with a total pressure of 700 mm Hg, 33.3% O_2 and 62.3% N_2 ; and an atmosphere with a total pressure of 258 mm Hg, 98.5% O_2 and 0.2% N_2 . It is found that except for mild changes in red cell values with hematocrit reduction of 6.7% and 9.1% in the 700-mm-Hg group and 258-mm-Hg group, respectively, most of the hematopoietic studies are normal. It appears that a 30-day exposure to the increased oxygen partial pressures used in this study does not significantly alter hematopoiesis.

A64-22056

A SIMPLE METHOD OF CHORIORETINAL BURN PROTECTION.

Howard A. Minners and Norris L. Newton (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). Aerospace Medicine, vol. 35, July 1964, p. 627-629. 7 refs.

Investigation of the feasibility of a method using pilocarpine induced miosis as protection against chorioretinal burn from high intensity light, such as the Sun or a nuclear fireball. An experiment is described which was conducted to study the significance of possible reduction in visual acuity at low levels of illumination

and after pilocarpine miosis. It is found that if miosis of 2.25 mm or less pupillary diameter is employed for retinal thermal protection, a pilot's visual acuity remains adequate for the performance of instrument readings under the minimum instrument illumination in current aircraft. Ciliary spasm secondary to pilocarpine miosis is not a major problem as measured by distance acuity and near point of accommodation measurements. Areas recommended for further investigation with respect to this approach are considered.

A64-22057

EFFECTS OF SOME TRANQUILIZING, ANALEPTIC AND VASODILATING DRUGS ON PHYSICAL WORK CAPACITY AND ORTHOSTATIC TOLERANCE.

R. V. Ganslen, B. Balke, F. J. Nagle, and E. E. Phillips (Civil Aeromedical Research Institute, Biodynamics Branch, Oklahoma City, Okla.).

Aerospace Medicine, vol. 35, July 1964, p. 630-633. 13 refs.

Study of the drugs Caffeine-Metrazol, Recordil, and Equanil. The following observations are made. Caffeine-Metrazol: a combination of this drug appears to have potency as antifatiguing medication and ergogenic aid, accomplishing an improvement in cardiac economy by increasing the stroke volume at a lowered heart rate and augmenting maximum cardiac output as well as maximum oxygen intake. Recordil (Flavon-7-ethyl-oxyacetate): the physical working capacity of the subjects is materially benefited by this drug, taken four hours before the exercise test. The absence of localized fatigue and leg pain supports the thesis that peripheral vasodilation is present and effective. The psychic-excitatory effect of Recordil cannot be explained except on the basis of some conceivable increased cerebral blood flow mechanism for which there is no evidence at this time. Equanil: disturbances of the vasomotor system become evident. A real hazard seems to exist with the tendency of blood pressures to be depressed, particularly with subjects who naturally possess low blood pressure. These vasomotor disturbances suggest central nervous system depression, especially of thalamic origin.

A64-22058

LACK OF PREDICTABILITY IN RATS TO EXHIBIT CHRONIC OXYGEN POISONING.

George H. Kydd, Leonard Kowalski, and Richard McGowan (U.S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Johnsville, Pa.).

(Aerospace Medical Association, Meeting, Los Angeles, Calif., Apr. 30, 1963.)

Aerospace Medicine, vol. 35, July 1964, p. 634-636. 12 refs.

Investigation of the effects of repeated exposure to high-pressure oxygen, performed on three groups of Sprague-Dawley descended rats. Toxicity effects consist of a paralysis which occurs after a variable number of exposures for individual rats. The paralysis starts in the forelimbs and may spread to involve other parts of the body until the animal is incapacitated, requiring assistance in feeding. Little, if any, remission is observed. Chronic oxygen toxicity is obtained in one group of animals while in the other two groups no permanent paralysis is obtained. It is suggested that a third factor, perhaps environmental, may have a role in predisposing rats to the development of the chronic signs of oxygen toxicity. The relationship of chronic to acute signs is discussed.

A64-22059

THE EFFECT OF DECREASED BAROMETRIC PRESSURE ON MAXIMUM PRESSURE-VOLUME RELATIONSHIPS OF THE HUMAN RESPIRATORY SYSTEM.

Louis F. Johnson, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).

(Aerospace Medical Association, Meeting, Los Angeles, Calif., Apr. 1, 1963.)

Aerospace Medicine, vol. 35, July 1964, p. 637-642. 8 refs.

Investigation of the maximum pressure-volume relationships at 30,000-ft pressure altitude and a comparison with relationships obtained at ground-level. Both at ground-level and at 30,000 ft, lung-volume changes are calculated by Boyle's law, and the results are checked against the actual lung-volume changes as measured by the body plethysmograph. At ground-level, the lung-volume

changes, as calculated by Boyle's law, agree well with the lung-volume changes of the pletysmograph for all starting lung volumes. However, at 30,000 ft, with low starting lung volumes, the calculated changes are less than those measured for expiratory and inspiratory pressures. Reasons for the discrepancy are considered. Pulmonary pressure as a function of lung volume is studied, and the experimental results are found to suggest that expiratory pressure is not strongly related to lung volume.

A64-22060

CARDIOVASCULAR DECONDITIONING DURING CHAIR REST.

Lawrence E. Lamb, Robert L. Johnson, and Paul M. Stevens (USAF, School of Aerospace Medicine, Clinical Sciences Div., Brooks AFB, Tex.).

Aerospace Medicine, vol. 35, July 1964, p. 646-649.

Presentation of the results of a study on the effect of strict chair rest with immobilization on orthostatic tolerance. The experimental conditions are not complicated by any special diets, excessive instrumentation, weightlessness, etc. It is shown that manifestations of orthostatic intolerance appear after approximately 4 days of the experimental conditions. These manifestations range from dizziness to fainting and circulatory collapse. Nausea and vomiting are also seen. This study demonstrates that simple physical inactivity of sufficient degree over a short period of time, uncomplicated by any other problems, will cause adverse changes in circulatory dynamics leading to syncopal reactions or circulatory collapse.

A64-22061

NON-ESTERIFIED FATTY ACIDS IN VENOUS BLOOD UNDER DIFFERENT EXPERIMENTAL CONDITIONS.

F. Vogt Lorentzen (Royal Norwegian Air Force, Institute of Aviation Medicine, Oslo, Norway).

Aerospace Medicine, vol. 35, July 1964, p. 649-652. 9 refs.

Investigation of the concentrations of nonesterified fatty acids in venous blood under and after the following conditions: exercise to exhaustion on untrained and trained subjects, standardized moderate exercise, hypoxia (20,000 ft), exercise and hypoxia, hypercapnia, hypocapnia, alkalosis, breathing pure oxygen. Some typical changes are described. Concentrations differ greatly from subject to subject, and from time to time in a single subject under the same conditions. The results of the presented investigation are compared with the results of other workers.

A64-22062

VIEWER REACTIONS TO ABSTRACT VISUAL FORMS.

J. J. Dreher and W. E. Evans (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).

(Aerospace Medical Association, Annual Meeting, Los Angeles, Calif., Apr. 29, 1963.)

Aerospace Medicine, vol. 35, July 1964, p. 653-657. 10 refs.

Statistical analysis of the emotional reaction to abstract visual forms, including types of triangles, semicircles, S-curves, the circle, types of crosses, and the swept-wing symbol. The method was a forced-choice reaction test based on a limited number of categories - i.e., adjectives. The adjectives selected as choices for the description of the abstract forms were: dangerous, pleasant, safe, fast, comfortable, and luxurious. The statistical evaluation of the results is based on the Kolmogorov-Smirnov cumulative frequency distribution test.

A64-22063

GRAVITATIONAL STRESS AND EQUILIBRATION.

Ulf Brandt (Royal Swedish Air Force, Medical Unit; Karolinska Institutet, Laboratory of Aviation Medicine, Stockholm, Sweden).

Aerospace Medicine, vol. 35, July 1964, p. 657-661. 10 refs.

Investigation of the effect of radial acceleration on the position sense. The human experiments show that even if g stress is strong enough to lead to unconsciousness - and hence also influence the psychic functions, giving rise to subjective experiences of a change in the subject's position in space - the appreciation of horizontality remains unimpaired. The capacity of reorientation also remains unimpaired.

A64-22064**EFFECTS OF WHOLE-BODY VIBRATION OF HUMANS ON PLASMA AND URINARY CORTICOSTEROID LEVELS.**

Renato Litta-Modignani, Ben B. Blivaiss, Edward B. Magid, and Inna Priede (Chicago Medical School, Dept. of Physiology, Chicago, Ill.).

Aerospace Medicine, vol. 35, July 1964, p. 662-667. 43 refs. Contract No. AF 33(616)-6889.

Investigation of the effects of whole body vibration on the hypothalamic-adrenal and hypophysis-thyroid systems. The experiment involved three exposures to 1-20 cps vibrations of 3 min-duration, with 3 min-rest periods in between. Analysis shows significant differences in serum protein-bound iodine. The alterations in blood and urine levels of steroids, while of statistical significance, are still considered within normal limits. Whether longer time exposure to vibration may produce changes to abnormal levels requires further investigation.

A64-22065**INFLIGHT TOXIC REACTIONS RESULTING FROM FLUOROCARBON RESIN PYROLYSIS.**

James B. Nuttall, Roy J. Kelly, Billy S. Smith, and Clarence K. Whiteside, Jr.

Aerospace Medicine, vol. 35, July 1964, p. 676-683. 6 refs.

Presentation of the sequence of events - and the following investigation - in a toxic hazard incident which occurred Sept. 1963, in a USAF C-54 and which involved a rather sudden onset of severe toxic reactions in all passengers and in crew members, with no apparent source of noxious substances. Toxic reactions occurred in 39 of the 40 persons on board. Post-flight investigation revealed the toxic reaction pattern to be typical of metal or polymer fume fever. Although the source of the toxic substance was proved to be fumes from the auxiliary power unit, the identification of the actual agent was difficult. A laboratory test situation utilizing the offending power unit resulted in the determination that the pyrolysis products from Teflon-impregnated asbestos tape wrappings on the exhaust manifold of the power unit were the cause of the toxic reactions. The asbestos tape involved was erroneously substituted for non-resin-containing tape.

A64-22078**A BIBLIOGRAPHY AND OVERVIEW OF HUMAN FACTORS REFERENCE WORKS.**

Paul G. Ronco (Tufts University, Institute for Psychological Research, Medford, Mass.).

Human Factors, vol. 5, Dec. 1963, p. 549-568.

Presentation of current bibliography prepared from references that actually exist in the files of the Human Engineering Information and Analysis Service at Tufts University. The bibliography is composed of four sections: (1) books, (2) bibliographies, (3) reports, and (4) journals. The current status of reference works in the field of human factors is evaluated.

A64-22079**A CRITIQUE OF STANDARD REFERENCE WORKS IN HUMAN FACTORS.**

David N. Lovinger and Charles A. Baker (Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.).

Human Factors, vol. 5, Dec. 1963, p. 569-576. 36 refs.

Study using the questionnaire technique to survey opinions of members of the Human Factors Society with regard to the adequacy of the reference works in that field of engineering. The responses indicate marked preferences for certain reference works, the preferences being partially correlated with the educational backgrounds of the responders. Suggestions for the improvement of handbooks and for the coverage of new areas are also solicited and analyzed, but they are found to be unrelated to educational background. Some possible directions for the improvement of reference works are discussed.

A64-22080**TOWARD AN IDEAL GUIDE FOR DISPLAY DESIGNERS.**

Donald B. Devoe (Sylvania Electric Products, Inc., Sylvania Electronic Systems, Waltham, Mass.).

Human Factors, vol. 5, Dec. 1963, p. 583-591. 27 refs.

Presentation of an integrated guide to the design of displays for complex systems. This ideal guide combines the latest knowledge in the form of principles, methods, human performance data, and hardware performance data in such a way that a user could enter the guide from a problem in any phase of display development and obtain the best guidance possible. A closer, more realistic look at the problems involved suggests that the state of the art today would permit a giant step toward the ideal and that, given proper support (which is feasible though unlikely), a guide could be produced and maintained that would be significantly closer to the ideal than are today's references.

A64-22081**SOME IDEAS ABOUT THE FUTURE OF HUMAN FACTORS REFERENCE WORKS.**

H. Wallace Sinaiko (Institute for Defense Analyses, Washington, D.C.).

Human Factors, vol. 5, Dec. 1963, p. 593-597. 15 refs.

Study of a number of current and future trends in human factors documentation. Selected activities and programs are suggested relevant to the improvement of future products and services.

A64-22513**MANUAL COMPUTER INPUTTING EXPERIMENTS.**

G. G. Gildner and W. T. Pollock (Bendix Corp., Aerospace Systems Div., South Bend, Ind.).

IN: NATIONAL CONVENTION ON MILITARY ELECTRONICS, 7TH, WASHINGTON, D.C., SEPT. 9-11, 1963, PROCEEDINGS. Conference sponsored by the Professional Technical Group on Military Electronics, Institute of Electrical and Electronics Engineers.

Edited by B. J. Goldfarb.

New York, Institute of Electrical and Electronics Engineers, 1963, p. 254-256.

Description of an experiment undertaken to collect empirical data, establishing human performance as a function of a number of response alternatives and response mechanisms, in the context of command and control systems, in which human operators are frequently required to initiate communications (i.e., input data or instructions) to a digital computer complex. Specifically, data were collected on the speed and accuracy of subjects in selecting and completing a response from 1, 2, 4, 7, and 10 alternative response possibilities, represented by the appropriate number pushbutton, toggle, rocker, and slide switches. It is noted that, while the experiment demonstrates statistically significant performance differences with the devices used, the speed, variability, and accuracy differences are small. Average simple reaction times measured in this experiment ranged from 0.49 to 0.63 seconds. These values are said to compare favorably with two studies using toggle switches in which movement times of about 0.5 sec were reported, and with two pushbutton studies, in which movement times of 0.3 and 0.6 sec were measured.

A64-22531**INFORMATION TRANSFER BETWEEN MEN AND COMPUTERS.**

Anthony Debons (USAF, Systems Command, Electronic Systems Div., Hanscom Field, Bedford, Mass.) and Joseph Spiegel (MITRE Corp., Bedford, Mass.).

IN: NATIONAL CONVENTION ON MILITARY ELECTRONICS, 7TH, WASHINGTON, D.C., SEPT. 9-11, 1963, PROCEEDINGS. Conference sponsored by the Professional Technical Group on Military Electronics, Institute of Electrical and Electronics Engineers.

Edited by B. J. Goldfarb.

New York, Institute of Electrical and Electronics Engineers, 1963, p. 377-388.

Discussion of the problem of computer to man information transfer. It is stated that the problem seems to revolve around whether the present state of the art in information requirements, man-machine capabilities, and system design techniques, provide a basis for the development of a technology which, to any degree, is better than intuition. It is noted that, in many respects, the evidence suggests that it may not be.

A64-22592

SPECIFICATIONS FOR HUMAN FACTORS.

Joseph W. Wissel (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D.C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N.Y., Society of Automotive Engineers, Inc., 1964, p. 133-135, 16 refs.

Examination of a proposed general military specification for human factors in lieu of several existing specifications. Two existing specifications cover a portion of the area encompassed by the more general proposed specification. It is stated that, in attempting to use existing specifications and standards at Lockheed, it was found necessary to develop condensed versions of standards which were tailored to the specific design problem. The designer of electronic checkout equipment requires different human factors information than the designer of ground handling equipment. As a result, several references were developed for use by Lockheed designers, and they have been highly effective. It is noted that the factor that may have greatest influence on the effectiveness of human factors specification is the shift from fixed fee contracting to incentive contracting.

A64-22635

MAN'S RELIABILITY IN THE X-15 AEROSPACE SYSTEM.

R. B. Wilson and J. L. Gaffney (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D.C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N.Y., Society of Automotive Engineers, Inc., 1964, p. 460-480.

Study of systems performance to estimate man's reliability, for the quantitative assessment of man's contribution to the performance of the man-machine system, from the standpoint of system design. It is stated that the history of X-15 performance reveals that the pilot, by unscheduled or unplanned inputs, enabled completion of almost twice as many flights as would otherwise have been completed on a routine basis. The prelaunch team (including the pilot) supported 92 successful routine launchings and overcame malfunctions to enable 10 additional launchings; 13 missions were unsuccessful because of team error. The maintenance crew was responsible for 6 failures out of 164 mission attempts. A reliability point estimate of 0.84 for the X-15 personnel subsystem is derived from these comparisons.

A64-22636

SPACECRAFT RELIABILITY + MAN = MISSION SUCCESS.

B. G. Peters, D. Amorelli, and J. T. Celentano (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D.C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N.Y., Society of Automotive Engineers, Inc., 1964, p. 481-489.

Discussion of a concept of reliability, which includes the relationship of man to total system reliability and the techniques and controls used to insure spacecraft mission success through reliability. Former maintainability concepts for weapon systems are reviewed briefly, pointing out their inadequacies for manned spacecraft. The reliability concepts for manned spacecraft which require that all systems function during a mission are examined. Examples of man's contribution to the reliability of aircraft and spacecraft systems are discussed. It is stated that these concepts will permit achievement of mission success that approaches 100%, using hardware with a reliability of 80%. The method for integrating reliability concepts, step by step, into design analysis and review, is discussed in detail, as is the subsequent extension into test and redesign activities. The method for integrating man into the space system reveals his capability to manually override, maintain, and repair. This upgrades reliability and provides the means to assure mission success.

A64-22637

TRANSIENTS IN RELIABILITY ASSOCIATED WITH HUMAN LEARNING.

James N. Anderson (Curtiss-Wright Corp., Curtiss Div., Caldwell, N.J.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D.C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N.Y., Society of Automotive Engineers, Inc., 1964, p. 490-497.

Consideration of an analysis of performance data for complex mechanical energy conversion and control equipment which has shown that human learning is a contributing factor to reliability growth. It is stated that resolution of technical problems is delayed until the personnel involved have developed the skills enabling them to do their jobs effectively. Added to the effect of wrong decisions and inadequately performed tasks is the accompanying lack of self-confidence that may result in the failure of personnel to assume responsibility for their actions. Case histories are presented to illustrate some of the situations that cause setbacks in reliability growth, with emphasis on that part caused by the learning process.

A64-22654

FACTORS AFFECTING FOOD DEVELOPMENT FOR SPACE FLIGHT.

John W. Young (NASA, Manned Spacecraft Center, Houston, Tex.).
Space World, vol. A-11, Sept. 1964, p. 37, 38.

Brief discussion of methods employed for the packaging and handling of food under zero-g conditions of space. The methods employed in the Mercury flights are considered, and the experiences of the various astronauts are reviewed. In these flights, squeeze tubes, like toothpaste tubes, were employed satisfactorily. Also considered are experiments with freeze-dehydrated food for the Gemini and Apollo flights. Using these foods instead of tubed foods would save, on a two-week Apollo lunar mission, nearly 100 lb of weight and 8400 in.³ of stowage space. The dehydrated foods are to be packaged in specially devised "zero-g" containers. Water for food reconstitution will be delivered to the spacecraft cockpit through specially designed probe nozzles. Food will be rehydrated by inserting the special probe into a sealed valve and applying the proper amount of pressure.

A64-22695

DETECTION OF ULTRASONIC WAVES INDUCED IN CEREBRAL TISSUE BY IRRADIATION OF LASER IMPULSES [SUR LA DETECTION D'ONDES ULTRASONORES INDUITES DANS LE TISSU CEREBRAL PAR IRRADIATION D'IMPULSIONS LASER].
Maurice Marchal, Marc Bruma, and Michel Velghe.
Académie des Sciences (Paris), Comptes Rendus, vol. 259, no. 2, July 15, 1964, p. 465-468. In French.

Demonstration that a laser beam creates ultrasounds at the moment of its impact in organic matter as well as affecting living matter by its photochemical or thermic action. It may also act by gradations of the electromagnetic field. The equipment is described, and results of three experiments, with photographs of oscilloscope traces, are presented.

A64-22812

FATIGUE, WORK DECREMENT, AND ENDURANCE OF WOMEN IN A SIMPLE REPETITIVE TASK.

William R. Pierson and Aileen Lockhart (Lockheed Aircraft Corp., Lockheed-California Co., Burbank; Southern California, University, Dept. of Physical Education, Los Angeles, Calif.).
Aerospace Medicine, vol. 35, Aug. 1964, p. 724, 725, 11 refs.
Research supported by the University of Southern California.

Investigation of the relationships between fatigue, work decrement, and isotonic endurance for women performing a simple stimulus-response task. Fifteen women of mean age 19.5 years were tested. Each subject was instructed to release a microswitch and extend her hand through a photoelectric beam upon presentation of a visual stimulus. The reaction time (RT) from the onset of the stimulus to the release of the switch, and the movement time (MT) from the release of the switch to the interruption of the beam were recorded, as were the isotonic endurance limits beyond which the

subjects could not continue. The results are compared with those for men under similar conditions. It is found that the RT is greater and the MT smaller for men. In addition, men have a greater endurance.

A64-22813

GRAVITY, RADIATION AND GROWTH.

P. O'B. Montgomery, Eugene Rosenblum, and Betty Stapp (Texas, University, Southwestern Medical School, Depts. of Pathology and Microbiology, Austin, Tex.; Woodlawn Hospital).

Aerospace Medicine, vol. 35, Aug. 1964, p. 731-733.

Grant No. NSG-210-63; AEC Contract No. AT-(40-1)-2478.

Study of the effects of continuously exposing phage-free *Escherichia coli* B cells to X-radiation from cobalt-60 sources for periods varying from 16 to 72 hrs. Cells so treated are found to show a depression of their growth curves when compared to unirradiated control cells. Ultrastructural observations indicate that these irradiated cells continue to enlarge despite their failure to divide. This enlargement involves the entire cell and its intracellular ultrastructural components. These effects are compared with those produced by increased gravity and are found to be similar in nature. The possibility that these effects are caused by genetic alterations is considered.

A64-22814

MICROWAVE HAZARDS EVALUATION.

H. S. Seth and S. Michaelson (Rochester, University, School of Medicine and Dentistry, Dept. of Radiation Biology, New York, N. Y.).

Aerospace Medicine, vol. 35, Aug. 1964, p. 734-739. 19 refs.

Study of hazards involved in working with microwave equipment, based on experimental work with animals and on observations made on personnel involved in microwave technology and radar development. The thermal and nonthermal effects of microwaves on living tissues are considered. Whole-body and localized microwave exposures on animals are discussed, as are observations on human workers. The effects of additional hazards associated with microwave equipment, including those due to ionizing radiation and toxic agents, are also considered. Safety requirements and precautions are discussed.

A64-22815

AN INVESTIGATION OF THE EFFECTS OF PRESSURE SUIT WEARING ON WORK OUTPUT CHARACTERISTICS.

L. Streimer, D. P. W. Turner, C. A. Tardiff, and T. L. Stephens (Boeing Co., Bioastronautics Section, Seattle, Wash.).

Aerospace Medicine, vol. 35, Aug. 1964, p. 747-751. 41 refs.

Determination of the effects of pressure suit wearing on the rate, amplitude and efficiency with which work is produced in normal and reduced traction environments. Two tasks were prescribed for the five men tested: treadmill walking, and repetitive flexion/-extension work cycles performed on the handle of a modified wall exerciser by raising and lowering a weight. The subjects were tested in a normal shirt-sleeve environment and in pressurized and unpressurized-but-ventilated pressure suits for three different suit models. The results indicate an impairment in suited-operator efficiency to an extent which would require the provision of more men or more time per unit work load for a given space task than is currently considered necessary, or the drastic reduction of workload requirements.

A64-22816

VARIATIONS OF THE VIBROCARDIOGRAM OVER THE PRECORDIUM.

Clarence M. Agress and Shigeo Nakakura (Cedars of Lebanon Hospital, Institute for Medical Research, Los Angeles, Calif.).

Aerospace Medicine, vol. 35, Aug. 1964, p. 752-757. 8 refs.

NASA-supported research.

Determination of the variations in timing and waveform of vibrocardiograms (VbCG) recorded from multiple positions on the precordium. Sixty-three VbCG's were recorded in each of 11 athletes from a precordial area extending from the right sternal border to the left anterior axillary line and from the second to the

fifth intercostal space. An area between the 4th to the 5th left intercostal spaces near the sternum was chosen as the standard location for the VbCG transducer. Clear waveforms were largely confined to the projection area of the cardiac silhouette onto the precordium. In nine subjects the construction of iso-temporal lines permitted the speed of transmission of the "J₁" and "J₂" VbCG waves across the surface of the chest to be calculated at ~15-18 m/sec.

A64-22817

HAND PREFERENCE IN AIRCREW.

J. L. Gedy (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).

(*Aerospace Medical Association, Meeting, Los Angeles, Calif., Apr. 30, 1963.*)

Aerospace Medicine, vol. 35, Aug. 1964, p. 757-763. 10 refs.

Comparative study of hand preference patterns in groups of pilots at different stages of training, in the attempt to establish a relationship between hand preference and flying skill. Both the consistency and strength of lateral preference were evaluated. It appears that it is better to have either a strong or a weak hand preference than to be between the two, and that between these alternatives, a strong preference would be the better.

A64-22818

ON THE ROLE OF GRAVITY IN HUMAN SPATIAL ORIENTATION.

Hermann Schöne (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, West Germany).

(*Deutsche Gesellschaft für Luft- und Raumfahrtmedizin, Munich, West Germany, Oct. 1963.*)

Aerospace Medicine, vol. 35, Aug. 1964, p. 764-772. 39 refs.

Research supported by Deutsche Forschungsgemeinschaft.

Study of human spatial orientation and its dependence on the gravity receptors of the human body. The perceived, subjective space coordinates were investigated as functions of the position of the body in fields of different gravitational strengths. The perceived vertical was measured as a function of the lateral tilting of the body by turning the body around a dorsoventral axis, and the perceived height of horizon was measured when the body was tilted forwards or backwards. The results are summarized and discussed.

A64-22819

THRESHOLDS FOR THE PERCEPTION OF LINEARLY INCREASING ANGULAR ACCELERATIONS.

H. von Diringshofen (München, Technische Hochschule, Munich, West Germany), G. Kissel (Entwicklungsring Süd, Munich, West Germany), and P. Osypka (Mayo Clinic, Rochester, Minn.).

(*International Congress of Aerospace Medicine, Rome, Italy, 1963.*)

Aerospace Medicine, vol. 35, Aug. 1964, p. 775-778.

Study of the dependence of thresholds, for the perception of increases in angular acceleration, on the acceleration gradient da/dt. Subjects were examined on a flight simulator to determine the behavior of the product (a) (t) of a given acceleration (a) and the time (t) required for its perception, for linearly increasing angular accelerations from 0.02°/sec to 0.2°/sec about the yaw axis. In addition, the angular velocity at the time of perception was measured. The results are presented and are compared with those of similar studies at constant angular accelerations carried out by Clark and Stewart. Implications of the results for aircraft control problems are indicated.

A64-22820

MEDICAL ASPECTS OF BUSINESS AVIATION.

Aerospace Medicine, vol. 35, Aug. 1964, p. 783-793. 11 refs.

Discussion of aeromedical problems encountered throughout the subsonic flight regime at altitudes up to 45,000 ft, in the attempt to aid industrial physicians to make decisions concerning the suitability of pilots and passengers for business flights in commercial aircraft. The environment in which flying and ground-support personnel must work is described, as is the medical selection of these employees. Also considered are the medical aspects of passenger selection, aircrew health maintenance, and the medical surveillance of flight operations. Common aeromedical problems are described. Appendices are presented which include extracts from Federal Air

Regulations on medical standards and certification, data on some business aircraft in common use, and a list of aeromedical consultation facilities.

A64-23105

POSSIBILITY OF UTILIZING THE HUMAN EYE MOVING SYSTEM FOR CONTROL PURPOSES [O VOZMOZHNOСТИ ISPOL'ZOVANIJA GLAZODVIGATEL'NOI SISTEMY CHELOVEKA V TSELIKHX UPRAVLENIJA].

A. Lauringson (Akademiia Nauk Estonskoi SSR, Institut Kibernetiki, Tallin, Estonian SSR).

Eesti NSV Teaduste Akadeemia, Toimetised, Füüsika-Matemaatika-ja Tehnikateaduste Seeria, no. 2, 1964, p. 121-126. 12 refs. In Russian.

Investigation of the possibility of replacing manual control in a control system by a system in which the command is taken directly from the tracking motion of the operator's eyeball. Oscillograms of the "operator" system (eye-brain-hand or leg) and the "eye" system (eye-brain-eye muscles), obtained as eye-movement responses to a moving visual stimulus, are presented and compared. It is found that the "eye" system has the more precise tracking capability at high frequencies and the shorter delay time. It can follow precisely not only linear motions but also accelerated, parabolic, exponential, sinusoidal, random, and similar motions.

A64-23136

SPACE MEDICINE - ANALYSIS AND POSSIBILITIES [RAUMFAHRTMEDIZIN - BEGRIFF UND MÖGLICHKEITEN].

E. H. Graul.

Weltraumfahrt Raketentechnik, vol. 15, May-June 1964, p. 68-74. In German.

General discussion of the foundations and principles of both aero and space medicine. In particular, the problems associated with the phenomenon of weightlessness and the effects of high-energy ionizing radiation are considered. Contributions to space biological and medical research made in Germany are reviewed.

A64-23188

HIGH TEMPERATURE-HIGH HUMIDITY ENVIRONMENTS.

Arthur A. Woodward, Jr. and Samuel A. Hicks (U.S. Army, Human Engineering Laboratories, Aberdeen Proving Ground, Md.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 195-203. 14 refs.

Discussion of the character of the human thermal environment in a tropical region and of the physiological and psychomotor response of men to such an environment. The effect on equipment is also considered. Data used in this study are those collected by a US Army Human Engineering Laboratories team during Operation SWAMP FOX II, a military research and development expedition carried out in the eastern part of the Republic of Panama in 1962. The data were collected during the rainy season in an area free of tall vegetation. The data are presented as summaries of hourly variation of the following thermal environment factors: air temperature, relative and absolute humidity, air movement, solar radiation, and WBGT Index taken both in the open and in the shade. On the basis of these data, the human thermal environment in a wet tropical area is discussed. The response of men to such an environment is studied using such physiological responses as pulse rates, average body temperatures, and rates of sweat production as indicators. A confinement study in such an environment is also presented. Psychomotor responses - e.g., equilibrium and hand steadiness, to such a condition are considered. Attention is also given to the effect of the tropical environment on equipment. Difficulties are reported to arise especially with electronic equipment, which proved itself quite susceptible to moisture.

A64-23200

EVALUATION AND COMPATIBILITY TEST OF A TWO-MAN LIFE SUPPORT SYSTEM DURING SIMULATED MISSION CONDITIONS.

A. H. Bay and W. K. Wright (McDonnell Aircraft Corp., St. Louis, Mo.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 277-282.

Discussion of the manned test program of the Gemini environmental control system, conducted by the Systems Laboratory of the McDonnell Aircraft Corporation in cooperation with NASA. The program consists of subjecting a complete environmental control system, with the exception of the space radiator, to both normal and secondary modes of operation while subjected to simulated environments and conditions which could be encountered during an actual Gemini mission. Initial plans and preparations made to insure personnel safety throughout the program, and results obtained to date in the simulated missions are considered.

A64-23207

ASSESSMENT OF HUMAN SUBJECT RESPONSE TO IMPACT ACCELERATION.

Edwin Hendler (U.S. Naval Air Engineering Center, Aerospace Crew Equipment Laboratory, Philadelphia, Pa.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 333-336.

Discussion of the problem areas and difficulties associated with assessing the effects of impact accelerations on living organisms. Approaches to the solution of some of the difficulties are noted, and a review of some recent work is also given. Protection against the mechanical effects of impact acceleration is considered in the discussion, the importance of the physiological aspect of the problem being mentioned only briefly.

A64-23213

HUMAN ENGINEERING STUDIES IN ACCELERATION ENVIRONMENTS.

Randall M. Chambers (U.S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Johnsville, Pa.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 385-404. 14 refs.

Discussion of the effects of linear accelerations which may be encountered during launch, re-entry, and certain closely related maneuvers, on the astronaut's physiological and performance capabilities. The development of dynamic flight simulations on the human centrifuge and the consequent provision for laboratory-controlled environments in which physiological and performance capabilities of astronauts and other test pilots within a wide range of accelerations can be tested are considered. The use of these centrifuge simulations in the testing of spacecraft components; piloting tasks; and concepts, such as instrument displays, control devices, contour couches and seats, restraint harnesses, pressure suits, and biomedical sensors, is studied. Surveyed also are the uses of centrifuge simulations for providing acceleration training and physiological conditioning for astronauts and pilots. Attention is also given to the utilization of the centrifuge for the purpose of obtaining general human engineering data which may be used in evaluating man-machine components and systems during exposure to various acceleration environments.

A64-23246

THE EVALUATION OF CANDIDATE SPACESUIT MATERIALS AND ASSEMBLIES.

Allan Juster (Republic Aviation Corp., Farmingdale, N. Y.).

IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15, 1964, PROCEEDINGS.

Mt. Prospect, Ill., Institute of Environmental Sciences, 1964, p. 637-640.

Discussion of the scope of testing necessary in order to assure operational integrity of materials for space suit use. Typical exposure environments are considered, and the types of tests run on the various suit materials are presented. Evaluation of mechanical assemblies, including cold weld tests, is discussed. Extent of surface adhesion, evaluation, abrasion study, and thermal conductivity tests are commented on, and the environmental equipment is described.

A64-23253

THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.

Edited by W. H. Weihe (High Altitude Research Station Jungfrauoch, Bern, Switzerland).

New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964.

351 p.

\$12.

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BLOOD VOLUMES AND HEART WEIGHTS IN TWO STRAINS OF RATS DURING ADAPTATION TO A NATURAL ALTITUDE OF 12,470 FT. George A. Feigen and Paul K. Johnson (Stanford University, Stanford; California, University, White Mountain Research Station, Big Pine, Calif.), p. 45-58.

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EXISTENCE AND GROWTH OF BACTERIA AT HIGH ALTITUDE. Gertrud Keck and Rudolf Buchmeiser (Wien, Tierärztliche Hochschule, Vienna, Austria), p. 153-165. 9 refs. [See A64-23255 19-16]

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POSSIBLE ROLE OF CATECHOLAMINES IN ALVEOLAR-ARTERIAL OXYGEN GRADIENT AT ALTITUDE. F. Kreuzer (Nijmegen, University, Nijmegen, Netherlands), p. 225-232.

WORK CAPACITY AND ITS LIMITING FACTORS AT HIGH ALTITUDE. Bruno Balke (Federal Aviation Agency, Oklahoma City, Okla.), p. 233-247. 9 refs. [See A64-23259 19-16]

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A64-23254

EFFECT OF CHRONIC EXPOSURE TO HYPOXIA ON BLOOD PRESSURE AND THYROID FUNCTION OF HYPERTENSIVE RATS.

Melvin J. Fregly and Arthur B. Otis (Florida, University, College of Medicine, Dept. of Physiology, Gainesville, Fla.).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 141-152; Discussion, p. 152. 22 refs.
Contract No. AF 41(657)-370.

Study of the effect of exposure to lowered ambient oxygen tension on development of renal hypertension in genetically pure, white rats. Chronic exposure to an atmosphere containing 13% oxygen protects against development of renal hypertension in rats. It is felt that the mechanism through which the rats are protected may involve the thyroid gland since certain criteria for the assessment of thyroid function, using radioactive iodide, suggest depression of activity. Other physiologic mechanisms, brought into play as a result of hypoxia, may also contribute.

A64-23255

EXISTENCE AND GROWTH OF BACTERIA AT HIGH ALTITUDE.
Gertrud Keck and Rudolf Buchmeiser (Wien, Tierärztliche Hochschule, Institut für Bakteriologie und Tierhygiene und Institut für Physik, Vienna, Austria).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 153-165; Discussion, p. 165. 9 refs.

Investigation of the existence of bacteria in the outdoor air and in closed rooms at high altitude and of the effects of high-altitude climate on bacterial growth. Studies were made at the research station at Jungfraujoch, Switzerland, situated in a region of glaciers at a height of 3450 m. Aerosol samples were taken in a laboratory and on a roof of the station, and in closed, well-ventilated rooms frequented by varying numbers of persons. On 31 filters of out-of-door air taken on 26 days, only very low concentrations of four different organisms were detected: *B. brevis*, *B. mesentericus*, *B. subtilis*, and diplococci. The number of bacteria was also small in the indoor air. Experiments were performed on the effects of atmospheric conditions on known bacterial samples. Solar radiation is found to inhibit or suppress the growth of certain micro-organisms, requiring a shorter period of time to be effective than at lower altitudes.

A64-23256

REGULATION OF BREATHING IN EXERCISE AT HIGH ALTITUDE.
Pierre Dejours (Paris, Université, Faculté de Médecine, Laboratoire de Physiologie, Paris, France).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 201-205; Discussion, p. 206-208. 13 refs.

Analysis of studies on the adjustment in pulmonary ventilation during exercise at high altitude. According to a neurohumoral theory of breathing control in exercise given previously by the author, the ventilatory adjustment to exercise has a fast component of rapid ventilation increase occurring abruptly at the onset of exercise and a slow component of secondary rise occurring after 20-40 sec, eventually reaching a new steady state. The relative contributions of these two components to the ventilatory response are compared for sea-level and high-altitude environments. Possible physiologic factors influencing the control of this response are discussed. The effect of suddenly inhaling pure oxygen on the respiratory regime of a subject previously breathing air is considered.

A64-23257

MUSCULAR EXERCISE AT GREAT ALTITUDES.
L. G. C. Pugh (National Institute for Medical Research, Medical Research Council Laboratories, Div. of Human Physiology, London, England).

IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 209, 210.

Analysis of studies made by the 1960-61 Himalayan Scientific and Mountaineering Expedition on muscular exercise at heights of 4600 m, 5800 m, 6400 m, and 7300 m, using a modified von Döbeln bicycle. Control observations were made at sea level before the expedition. The relationships between work rate, oxygen intake, ventilation, heart rate, and cardiac output were studied for a wide range of work loads. The results are discussed.

A64-23258

OXYGEN TRANSFER BY THE LUNGS AT HIGH ALTITUDE.
John B. West (Buffalo, University, Medical School, Dept. of Physiology, Buffalo, N. Y.).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 211-215; Discussion, p. 215.

Study of the diffusion capacity of the lungs and its relation to oxygen consumption at high altitudes. Members of the 1960-61 Himalayan Scientific and Mountaineering Expedition were tested at sea level and at altitudes of 4600 m, 5800 m, and 7440 m. The diffusing capacity of the lungs for CO was measured on subjects pedalling a stationary bicycle at work levels of 300 and 900 kg-m/min. The results showed only a small change in overall diffusing capacity with altitude. Further tests indicated that even this small change was not the result of adaptive changes in the lung itself. To determine how sufficient O₂ could be transferred into the blood to maintain high work levels in spite of this lack of change in lung diffusing capacity, measurements of arterial O₂ saturation were made and were related to the alveolar O₂ tension and the O₂ consumption. It is found that the body can only maintain sufficiently high O₂ consumptions by accepting extremely low arterial O₂ saturations.

A64-23259

WORK CAPACITY AND ITS LIMITING FACTORS AT HIGH ALTITUDE.
Bruno Balke (Federal Aviation Agency, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 233-240; Discussion, p. 240-247. 9 refs.

Review of experiments on qualitative and quantitative changes in work capacity at high altitude. Acclimatization studies in the Alps, the Rocky Mountains of Colorado, and the Peruvian Andes are discussed, and the roles of the circulatory and respiratory systems in imposing limitations on work capacity are examined. In addition, Cerretelli, in a discussion, describes experiments on the effects of great increases in blood viscosity on acclimatization.

A64-23260

HYPOXIC-HYPERCAPNEIC INTERACTION AT HIGH ALTITUDE.
Stephen M. Tenney, J. E. Remmers, and John C. Mithoefer (Dartmouth Medical School, Dept. of Physiology, Hanover, N. H.).
IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.
Edited by W. H. Weihe.
New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 263-270; Discussion, p. 270-272. 11 refs.
Grant No. USPHS H-2888 (C4).

Study of the interaction of hypoxic and hypercapnic stimuli in the ventilatory response of acclimatized subjects at high altitude. The ventilatory response to graded increments of alveolar CO₂ was

measured at three levels of alveolar O_2 tension for three subjects in 17 separate experiments at sea level and six experiments at high altitude. The results seem to indicate that acclimatization to high altitude does not alter the magnitude of the hypoxic potentiation of the CO_2 drive on ventilation, but that the hypercapnic potentiation of the hypoxic stimulus is enhanced. This is taken to imply that pH is an important factor in the interaction mechanism.

A64-23261

THE ROLE OF CEREBROSPINAL FLUID IN THE RESPIRATORY ACCLIMATIZATION TO HIGH ALTITUDE IN MAN.

John W. Severinghaus and R. A. Mitchell (California, University, Medical Center, Cardiovascular Research Institute, San Francisco, Calif.).

IN: THE PHYSIOLOGICAL EFFECTS OF HIGH ALTITUDE; PROCEEDINGS OF A SYMPOSIUM HELD AT INTERLAKEN, SWITZERLAND, SEPTEMBER 18-22, 1962.

Edited by W. H. Weihe.

New York, Macmillan Co.; Oxford, Pergamon Press, Ltd., 1964, p. 273-284; Discussion, p. 284-288, 22 refs.

Grants No. USPHS H-6285; No. RG-5881.

Experimental study of the possibility that acclimatization to high altitude is determined by the acid-base balance of the brain extracellular fluid and of the cerebrospinal fluid (H^+) as sensed by the medullary CO_2 chemoreceptor. Experiments are described which indicate that the pH of these fluids is carefully regulated to about 7.32 by the combined action of this chemoreceptor and the blood-cerebrospinal fluid (CSF) barrier. In the normal state, CSF bicarbonate concentration is determined indirectly by various respiratory stimuli such as those arising in the cortex, the carotid body, and, perhaps, other blood (H^+) receptors.

A64-23297

A GENERALIZED INVESTIGATION OF A REMOTELY CONTROLLED LUNAR SURFACE VEHICLE.

Ralph V. Kinney (Bendix Corp., Bendix Systems Div., Ann Arbor, Mich.).

(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 23-26, 1964.)

IEEE International Convention Record, vol. 12, pt. 7, 1964, p. 204-211.

Discussion of problems expected to arise in the attempt to exercise control from the Earth on a vehicle that is roving the surface of the Moon. A complete definition of the problem and the parameter relationships to the problem are presented. Certain of these parameters render analytical approaches to solution relatively unsuccessful. A real time digital simulation incorporating an operator in the loop has been developed to study the complete problem in a quantitative manner. The simulation uses a command/-display console driven by a high-speed digital computer; an input-output buffer allows continuous communication between the operator at the console and the computer program. The simulation allows a wide range of control system parameter variations for evaluation in either continuous or discontinuous modes of vehicle operation.

A64-23298

QUICKENED MANUAL FLIGHT CONTROL WITH EXTERNAL VISUAL GUIDANCE.

Theodore Gold (Sperry Rand Corp., Sperry Gyroscope Co., Information and Communications Div., Great Neck, N.Y.).

(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 23-26, 1964.)

IEEE International Convention Record, vol. 12, pt. 7, 1964, p. 212-219.

Discussion of visual aids for guidance and control with potential applications to the problems of rendezvous in space and the landing of a high-performance naval aircraft on the deck of a carrier. Techniques for enhancing visual flight control by using quickening concepts are described. The pilot receives both guidance and flight control information from the relative positions of projected virtual images appearing through the windshield and landmarks in the real world. The vehicle may then be controlled to couple to a preselected flight path in space terminating on the landmark. This is accomplished in a continuous control task in which the pilot

tracks the landmark with a director image. First, second, and third order quickened control systems are described and analyzed from a dynamic standpoint.

A64-23299

ANALYTICAL METHODS IN THE STUDY OF MAN-MACHINE SYSTEMS.

Barbour Lee Perry and H. P. Birmingham (U.S. Naval Research Laboratory, Washington, D.C.).

(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 23-26, 1964.)

IEEE International Convention Record, vol. 12, pt. 7, 1964, p. 220-225. 5 refs.

Discussion of some basic concepts of human factors engineering. "Human Factors" is an interdisciplinary effort oriented toward the achievement of maximally effective man-machine systems. This emerging science has particularly close ties to mathematics, electronics, physics, and experimental psychology. The application of analytical techniques to the study of man-machine systems is discussed. Also analyzed is the utility of the Laplacian concept in characterizing human behavior within systems. The benefits of these approaches are evident in examples of the optimal design of vehicular control systems and in sophisticated approaches to the selection and training of operators.

A64-23300

PERIPHERAL AUGMENTATION OF RANGE PERCEPTION IN PICTORIAL DISPLAYS.

Harry G. Sperling, Robert C. McLane, and Duane A. Anderson (Minneapolis-Honeywell Regulator Co., Honeywell Military Products Group, Research Laboratory, St. Paul, Minn.).

(Institute of Electrical and Electronics Engineers, International Convention, New York, N.Y., Mar. 23-26, 1964.)

IEEE International Convention Record, vol. 12, pt. 7, 1964, p. 226-232.

Discussion concerning the manual controllability of a six-degree-of-freedom vehicle in which separate control of each degree of freedom is provided. Maneuverability of this sort is offered by the tandem-propeller submarine concept of Haselton. One of the specific goals in the research was to quantify the information presented by a pictorial display and to seek out methods of providing equal accuracy of control in all axes. A peripheral visual display was found to be necessary to augment fore and aft range perception. A control station mockup including a six-degree-of-freedom input control and a vertical pictorial or contact analog-type display with an integrated quickened tracking symbol was combined with a real-time simulation of vehicle characteristics for controllability performance tests.

A64-23667

PROTECTION FROM RADIATION HAZARDS DURING THE FLIGHTS OF SPACESHIPS "VOSTOK-3" AND "VOSTOK-4" [OBESPECHENIE RADIATIONNOI BEZOPASNOSTI PRI POLETAKH KORABLEI "VOSTOK-3" I "VOSTOK-4"].

V. V. Antipov, Iu. I. Efremov, M. D. Nikitin, I. A. Savenko, and P. P. Saksonov.

Kosmicheskie Issledovaniia, vol. 1, Sept.-Oct. 1963, p. 303-308. 10 refs. In Russian.

Brief survey of the radiation measurements and biological experiments conducted during the flights of Vostok-3 (1962 AM 1) and Vostok-4 (1962 AN 1). The radiation doses measured for Vostok-3 and Vostok-4 were 55 millirad and 41 millirad, and for the clothing of the individual pilots 48-64 millirad and 37-46 millirad, respectively. It is shown that the results of the biological experiments correlate well with the measured radiation dose. The ground observations of solar activity, which were conducted to protect the astronauts, are outlined.

A64-23669

EFFECT OF SPACE-FLIGHT FACTORS UPON THE MICROSPORES OF TRADESCANTIA PALUDOSA FOR SPACESHIPS "VOSTOK-3" AND "VOSTOK-4" [VLIANIE FAKTOROV KOSMICHESKOGO POLETA NA KORABLIKH-SPUTNIKAKH "VOSTOK-3" I "VOSTOK-4" NA MIKROSPORY TRADESCANTIA PALUDOSA].

N. L. Delone, P. R. Ponovich, V. V. Antinov, and V. G. Vysotskii. *Kosmicheskie Issledovaniia*, vol. 1, Sept.-Oct. 1963, p. 312-325. 15 refs. In Russian.

Discussion of tests of *Tradescantia* microspores during the flights of Vostok 3-(1962 AM 1) and Vostok 4-(1962 AN-1), with emphasis on the samples fixed after 56 hours of flight to eliminate vibration and acceleration effects during the landing phase. An analysis of the material obtained revealed a new type of microspore rearrangements in the form of spherical fragments. These are observed not only in the metaphase, anaphase, and telophase but also in prophase and interphase. Several observed mitosis disturbances are noted.

A64-23670

EFFECT OF SPACE-FLIGHT FACTORS UPON THE FREQUENCY OF OCCURRENCE OF SEX-LINKED RECESSIVE LETHAL MUTATIONS FOR THE *DROSOPHILA MELANOGASTER* [VLIIANIE FAKTOROV KOSMICHESKOGO POLETA NA CHASTOTU VOZNIKNOVENIIA STSEPLENNYKH S POLOM RETSESSIVNYKH LETAL'NYKH MUTATsii U *DROSOPHILA MELANOGASTER*]. Ia. L. Glumbotskii, Iu. A. Laikin, G. P. Parfenov, and E. M. Kamshilova.

Kosmicheskie Issledovaniia, vol. 1, Sept.-Oct. 1963, p. 326-334. 11 refs. In Russian.

Comparison of data obtained during the flights of Vostok-3 (1962 AM 1) and Vostok-4 (1962 AN 1) on the frequency of occurrence of several types of mutation for the *Drosophila* with similar data obtained during five previous space flights. It is found that, in spite of the large discrepancy between the reactions of the *Drosophila* and other specimens (mice, plant seeds) observed during the different flights, there is a distinct similarity in the reaction of all specimens to the conditions of an individual flight. A cause for this is seen in the variability of the mutafacient effect of space-flight factors from flight to flight. The contribution to this effect of weightlessness, rocket vibrations, acceleration, and cosmic radiation is examined, with the conclusion that none of these factors alone can be responsible for these effects. Ways of studying the combined action of spaceflight factors are considered.

A64-23764

EFFECTS OF PURE OXYGEN INHALATION, ALTITUDE, AND PRESSURE BREATHING ON MAXIMUM BREATH HOLDING TIME. Haruo Ikegami (Aeromedical Experimental Laboratory, Japan). *Japanese Journal of Aerospace Medicine and Psychology*, vol. 1, June 1964, p. 61-66. 11 refs. In Japanese.

Study of the maximum breath-holding time (MBHT) of five healthy adults during air breathing, pure oxygen inhalation at ground level and at altitude, and during pressure breathing at altitude. Results presented are: (1) a decrease of alveolar O_2 pressure and an increase of alveolar CO_2 pressure are both major factors in limiting MBHT; (2) oxygen inhalation at ground level extended MBHT by 35%; (3) the MBHT is unchanged at altitudes up to 6000 m and is markedly shortened at 10,000 m; and (4) pressure breathing with pure oxygen at altitudes of 10,000 m markedly extended MBHT.

A64-23766

SPACE FLIGHT AND THE LACK OF SENSORY STIMULATION. Fushiro Motobayashi and Sukeo Sugimoto (Nagoya University, Research Institute of Environmental Medicine, Nagoya, Japan). *Japanese Journal of Aerospace Medicine and Psychology*, vol. 1, June 1964, p. 82-85. 7 refs. In Japanese.

Experimental analysis of the psychological and physiological alteration which may be produced by isolation from, or limited exposure to, sensory stimulation. Particular attention is devoted to the effect of prolonged application of weak and monotonous visual, auditory, and tactile stimulation. This study is motivated by the lack of sensory stimulation that will be encountered in space flight. It is felt that suitable indicators for such an analysis have yet to be developed.

A64-23767

A STUDY ON THE PHYSIOLOGICAL EFFECTS OF HIGHLY OXYGENATED ENVIRONMENT. II.

Hisashi Saiki (Tokyo University, School of Medicine, Dept. of Physiology, Tokyo, Japan).

Japanese Journal of Aerospace Medicine and Psychology, vol. 1, June 1964, p. 86-97. 11 refs. In Japanese.

Examination of the cardiac responses of guinea pigs and rabbits to high oxygen exposure for 72 to 120 hr under 1 atm pressure and stress loadings of 7 and 11 g. A control group of these animals was kept in an environment which had a scarcity of oxygen, and the effects of the two different environments on the animals were compared. Exposure to the high-oxygen atmosphere caused both the guinea pigs and rabbits to lose weight. Many of these died in several days, and their heart rate increased in a normal air environment in which they were placed shortly before they died.

A64-23796

MEASUREMENT OF EYE MOVEMENTS BY CONTACT LENS TECHNIQUES - ANALYSIS OF MEASURING SYSTEMS AND SOME NEW METHODOLOGY FOR THREE-DIMENSIONAL RECORDING.

Leonard Matin (Johns Hopkins University, Dept. of Psychology, Baltimore, Md.).

Optical Society of America, Journal, vol. 54, Aug. 1964, p. 1008-1018. 8 refs.

NSF Grants No. G-1812; No. GB-944.

Development of a vector treatment for optical systems utilizing contact lenses for the measurement of eye movements. The treatment is then used to describe some new techniques which permit measurement of three orthogonal components of ocular rotation - e.g., horizontal, vertical, and torsional. Mirrors may be embedded directly in the lens at nearly any angle. No stalk is required between contact lens and mirror. Such a system has been constructed using IR beams, which permit measurement of eye movements simultaneously with visual phenomena requiring dark-room viewing. The present system resolves movements of 2" of arc.

A64-23808

STUDY OF THE ACOUSTIC REFLEX FEEDBACK LOOP.

Peter J. Dallos (Northwestern University, Auditory Research Laboratory, Evanston, Ill.).

IEEE Transactions on Bio-Medical Engineering, vol. BME-11, Jan.-Apr. 1964, p. 2-7. 11 refs.

NIH Grant No. B 1310.

Investigation of the acoustic reflex contraction of the stapedius and tensor tympani muscles of the middle ear upon stimulation with intense sound. This reflex is believed to act as a protective mechanism in limiting the magnitude of high-level sounds before they reach the cochlea. The reflex was studied by measuring the variation of the mechanical input impedance to the ears of human subjects as the auditory system was stimulated with step-inputs of high-intensity white noise. It was found that the response to these stimuli possessed asymmetrical properties. The transient corresponding to the activation of the reflex (muscle contraction) was rapid, while the relaxation transient was somewhat slower. The system transfer function was obtained for both the onset and cessation responses. A piecewise linear model is derived which describes the entire reflex arc. This model was rendered unstable by external circuitry, and the predicted characteristics of the ensuing oscillation are found to agree with the experimentally obtained behavior.

A64-23809

A PERSONALIZED RADIO TELEMETRY SYSTEM FOR MONITORING CENTRAL NERVOUS SYSTEM AROUSAL IN AEROSPACE FLIGHT.

D. G. Simons (USAF, School of Aerospace Medicine, Dept. of Aviation Medicine, Brooks AFB, Tex.) and W. Prather (USAF, School of Aerospace Medicine, Technical Services Branch, Biomedical Engineering Section, Brooks AFB, Tex.). (Annual Conference on Engineering in Medicine and Biology, 15th, Chicago, Ill., 1962.)

IEEE Transactions on Bio-Medical Engineering, vol. BME-11, Jan.-Apr. 1964, p. 40-51. 30 refs.

Description of a total medical monitoring system for identifying the physiological patterns indicative of levels of central nervous system (CNS) arousal. This personalized radio telemetry system

analyzes four measures: electroencephalogram (EEG), base skin resistance and galvanic skin resistance (BSR/GSR), heart rate, and respiratory rate. The data acquisition, recording, and analysis equipment of the system are described, as are methods for overcoming problems of electronic interaction which arise. Sample results of data obtained with this system are presented and indicate the suitability of the system for monitoring levels of CNS arousal under dynamic aerospace stress conditions.

A64-23810

A MODIFICATION OF A PROPOSED MODEL FOR THE EYE TRACKING MOVEMENTS.

Theodosios Pavlidis (California, University, Dept. of Electrical Engineering, Berkeley, Calif.).

IEEE Transactions on Bio-Medical Engineering, vol. BME-11, Jan.-Apr. 1964, p. 52. 8 refs.

Contract No. AF AFOSR 292-63.

Description of a method for improving Young's sampled-data model for the eye tracking movements. Errors are indicated in Young's determination of the velocity limit below which only that part of the model corresponding to the saccadic system will respond, the pursuit system remaining inactive. The use of an elementary neural net capable of performing velocity estimation is suggested so that the model will more closely agree with physiological experiments.

LC ENTRIES

A64-80717

AVIATION ACCIDENTS OF UNDETERMINED ORIGIN LES ACCIDENTS AERIENS D'ORIGINE INDETERMINEE.

J. Fabre, J. Ginet, and J. Rozier (Centre d'Enseignement et de Rech. de Med. Aeron., Paris, France).

Revue des corps de santé des armées terre mer air, vol. 4, Oct. 1963, p. 557-576. In French.

Sixty-five accidents of undetermined origin are grouped, and an analysis made of the known causative factors. Tables are presented of the number of accidents, hours of flight, type of aircraft (jets, two-, and three-engine), seasonal analysis, pilot's age, time of accidents, type of aircraft and duration of flight, type of aircraft and stage of flight when accident occurred (takeoff, landing, firing, etc.), altitude of accident, and geographical distribution in and outside Algeria. The tables revealed that accidents occurred in the morning and afternoon throughout the year, regardless of season. The pilot was about 27 years of age with good flight experience (800 hours), generally less for jet pilots (100 hours). On T.6 aircraft the accidents occurred at low altitude, and in 25% of jet aircraft below 3,000 meters. In Algeria, 23% of aircraft accidents were caused by antiaircraft firing, 17% by mechanical factors; 23% by pilot error; 20% by physical disorders; and 7% by weather conditions. Outside Algeria and the region of antiaircraft firing, the causes were 37% mechanical; 25% pilot error; 23% pilot sickness; and 15% weather.

A64-80718

APPLICATIONS OF RESPIRATORY PHYSIOLOGY TO AEROSPACE BIOLOGY (ORIENTATION DE LA PHYSIOLOGIE RESPIRATOIRE APPLIQUEE A LA BIOLOGIE AEROSPATIALE).

C. Jacquemin and P. Varenne (Centre d'Essais en Vol, Lab. Med.-Physiol., Bretigny-sur-Orge, Seine-et-Oise, France).

Revue des corps de santé des armées terre mer air, vol. 4, Oct. 1963, p. 589-599. 35 refs. In French.

A review of the literature on respiratory physiology as applied to aerospace medicine is presented. Respiratory exchanges take place in three steps: cellular (higher nervous system), blood, and lung. At each step the gradients of oxygen partial pressure and carbon dioxide play an important role. Respiratory exchanges are discussed in relation to hypoxia, hyperoxia, hypocapnia, hypercapnia, and to mechanical ventilatory systems (inhalators, pressure suits, and cabin ventilation). Results of studies show that mechanical ventilatory systems are important in controlling respiratory gas partial pressure and in regulating aggressive agents (decompression, acceleration, compression of all types, etc.). Biometric methods aid in the evaluation of respiratory gas exchanges and in devising means of protecting man against unusual ecological conditions. They include gasometric techniques (mass spectrography) and graphic, analogic, and mathematical models.

A64-80719

THE EFFECTS OF NOISES ON VIGILANCE AS A FUNCTION OF THEIR PHYSICAL AND PSYCHOPHYSIOLOGICAL CHARACTERISTICS (LES EFFETS DES BRUITS SUR LA VIGILANCE EN FONCTION DE LEURS CARACTERISTIQUES PHYSIQUES ET PSYCHOPHYSIOLOGIQUES).

A. Wisner (Centre Nat. de la Rech. Sci., Lab. de Physiol. du Trav., Paris, France), and C. Tarriere (Regie Nat. des Usines Renault, Lab. de Physiol. et de Biomechanique, Paris, France).

Acustica, vol. 14, 1964, p. 216-226. 33 refs. In French.

The effects of noise on behavior during a long period can be classified as a function of their significance and of their physical characteristics. Among the nonsignificant noises, those which are short and unexpected determine an immediate disturbance followed by an improvement of vigilance for a certain lapse of time. In a monotonous situation, continuous noises can sometimes slightly improve the results during an initial period soon followed by a markedly reduced attention. This double effect is much more marked when the noise is intense and shrill. When noises constantly changing in their intensity and in their spectral composition constitute the working environment, the degrading effect is still earlier and more marked than in the case of a monotonous noise. Music seems a more favorable condition for good vigilance and to be superior to the condition created by a monotonous noise. Speech gives very different results according to the subject's knowledge of the job.

A64-80720

ENZYMATIC STUDIES ON BENZENE INTOXICATION.

Masayuki Ikeda (Kyoto U., Faculty of Med., Dept. of Public Health, Kyoto, Japan).

Journal of Biochemistry, vol. 55, Mar. 1964, p. 231-243. 56 refs. Fujiwara Memorial Fund Grant; and Ministry of Education Grant-in-Aid supported res.

Changes of detoxicating enzyme activities in the liver during benzene intoxication were studied. Aryl 4-hydroxylase activity and UDP glucuronyltransferase activity showed an increase whereas that of the sulfating enzyme system showed no change in Wistar rats. Decrease in the activity of the sulfating enzyme system was observed in the severe intoxication of rabbits. Good coincidence was found between the level of enzyme activity and the amount of its metabolites in the urine of benzene intoxicated rats. The difference in susceptibility of individual rats to benzene was found to be due primarily to the quantitative difference in the sulfating enzyme activity in the liver. A simple time-saving method for the determination of phenol in urine is presented. The method requires less than 0.1 ml. of the urine specimen.

A64-80721

EFFECTS OF A PSEUDOERGOGENIC, SYMPATHICOTONIC SUBSTANCE ON RESPIRATORY OUTPUT DURING WORK (EFFETTI DI UNA SUSTANZA PSEUDOERGOGENA SIMPATICOTONICA SUL RENDIMENTO RESPIRATORIO IN LAVORO).

G. Curatolo and A. Rizzo (Palermo U., Ist. di Med. del Lavoro, Italy).

Lavoro Umano, vol. 16, Feb. 1964, p. 82-88. 12 refs. In Italian.

Ten trained cyclists between 17 and 21 years of age performed measured work of a progressive degree on the Fiech cycloergometer until respiratory breakdown was reached. The same exercise was repeated on another day, and the athletes, half an hour before arriving at the breakdown, were given metamphetamine and amphetamine intramuscularly. In six cases the breakdown was delayed after drug treatment; in two cases no changes in respiratory efficiency were observed; and in the other two cases an early fall in the oxygen consumption-ventilation ratio was noted. The combination of amphetamine and metamphetamine has a favorable effect on respiratory performance during work.

A64-80722

BIOLOGICAL EFFECTS OF INTERMITTENT ACOUSTIC STIMULATION. III. CHANGES IN THE URINARY EXCRETION OF 17-KETOSTEROIDS (EFFETTI BIOLOGICI DELLA STIMOLAZIONE ACUSTICA INTERMITTENTE. III. MODIFICAZIONI DELL'ESCREZIONE URINARIA DEI 17-KETOSTEROIDI).

C. De Vita, F. Laurini, and C. Serra (U. di Napoli, Clin. Otorinolaringoiatrica; and Clin. del Centro Traumatol. Orthoped., Reparto di Neurofisiol., Inail, Naples, Italy).

Bollettino della Società Italiana di Biologia Sperimentale, vol. 40, Apr. 30, 1964, p. 396-397. In Italian.

After various degrees of intermittent auditory stimulation for 30 minutes the following variations in the excretion of urinary 17-ketosteroids were observed: at 64 c.p.s., a constant increase up to + 0.53 mg.; at 128 c.p.s. and 4,096 c.p.s., no significant variation; at 256 c.p.s., constant variations up to 0.60 mg.; at 512 c.p.s. and 1,024 c.p.s., amphoteric behavior; at 2,048 c.p.s., pure and constant increase averaging + 0.625 mg. and at 8,192 c.p.s., a slight increase. No stimulating frequency produced a characteristic biological pattern, especially as seen at 256 c.p.s. where there was a decrease of 50% in sodemia, of 100% in kaliemia, 50% in glycemia, and of 17-ketosteroids. At 512 c.p.s., sodemia decreased by 50%, kaliemia increased by 100%, glycemia increased by 50%, and 17-ketosteroids by 50%. These data demonstrate the disturbance to homeostasis induced by auditory stimulation as mediated by central acoustic and diencephalic connections.

A64-80723

COMPARISON OF OBJECTIVE AND SUBJECTIVE DATA PERTAINING TO VIGILANCE TESTS (CONFRONTATION DE DONNEES OBJECTIVES ET SUBJECTIVES RELATIVES A DES EPREUVES DE VIGILANCE).

C. Tarriere (Regie Nat. des Usines Renault, Lab. de Physiol. et de Biomechanique, Paris, France).

Travail Humain, vol. 27, Jan.-Jun. 1964, p. 1-36. 9 refs. In French.

Thirty-five subjects performed 140 tests of 90 minutes corresponding to aspects of automobile driving under four conditions: calm (35-40 decibels), and motor noise, talking, and music at 90 decibels. The subjects reviewed their performance and were interviewed after each test. Objective criteria used to evaluate the quality of performance in relation to the signals presented were the total number of omissions, the number of useless answers, and the degradation index. Subjective data examined were estimates of signals seen and their duration, and estimates of the time intervals between signals. Also noted were mental activity, spontaneous movements, appreciation of sound level, and discomfort caused by noise. In a vigilance situation the subjects noted that boredom, sleepiness, and drowsiness occurred frequently (70% revealed decreased attention, 30% drowsiness). Subjective data indicated that sound was effective in combatting boredom and sleep and in increasing performance efficiency. Noise was considered an alertness factor by 90% of the subjects (talking and music were comparable in effectiveness), and as a distraction factor by 65% (talking caused more distraction than music). Eighty-five percent of the subjects reduced the sound volume.

A64-80724

THE AUDITORY INPUT DURING SLEEP AND WAKEFULNESS.

W. Baust, G. Bericucci, and G. Moruzzi (Nat. Res. Council, Neurophysiolo. Center, Pisa, Italy; and Pisa U., Physiol. Inst., Italy).

Pflügers Archiv für die gesamte Physiologie, vol. 280, Jun. 9, 1964, p. 89-91. 8 refs.

Grant No. PHS-G-NB-02990-03.

Peripheral modification of auditory input was investigated in cats which had the tendons of middle ear muscles cut, compared with those with normal ears. Simultaneously recorded indices were: neural response (N_1) to clicks at the round window, electroencephalogram, electromyogram of the cervical muscles, and electronystagmogram. Long lasting fluctuations of the amplitude of N_1 for the same intensity of stimulus were observed in all animals. The range was wider in the cats without functioning middle ear muscles. With normal ears there is a slight tonic decrease of N_1 amplitude during desynchronized sleep or attentive wakefulness. Phasic reductions or complete abolition of N_1 occur in association with twitches in the tensor tympani and the stapedius muscle, and with rapid eye movements in desynchronized sleep and with the orienting reaction during wakefulness. Cutting of the middle ear muscles obliterates the relation between the amplitude of N_1 and the different states of sleep and wakefulness. Phasic reductions are completely abolished.

A64-80725

CERTAIN SHIFTS OF CARBOHYDRATE METABOLISM UNDER THE ACTION OF TOTAL VIBRATION [O NEKOTORYKH SDVIGAKH V UGLE-VODNOM OBMENE PRI VOZDEISTVII OBSHCHEI VIBRATSII]. S. N. Sinityn, G. I. Rumiantsev, and K. Y. Voronova (F. F. Erisman, Moscow Sci. Res. Inst. of Hyg., USSR).

Gigiena i Sanitariia, vol. 5, May 1964, p. 44-48. In Russian.

The authors studied the effect of a prolonged vibration action at amplitudes of 15, 50, and 200 μ and a frequency of 75 c.p.s. on the sugar and glycogen blood level and the character of glycemic curves in rabbits; the same study also covered the sugar and glycogen blood content in dogs exposed to the action of vibration at an amplitude of 750 μ and a frequency of 50 c.p.s. In experiments performed on rabbits the following data were obtained: (1) the action of total vibration at an amplitude of 200 μ and a frequency of 75 c.p.s. caused a fall of sugar and glycogen blood level and changed the character of sugar curves; (2) total vibration at an amplitude of 50 μ and a frequency of 75 c.p.s. caused no drop of the sugar and glycogen blood level, but it brought about changes in glycemic curves; (3) total vibration at an amplitude of 15 μ and a frequency of 75 c.p.s. caused no shifts in the biochemical indices mentioned above; and (4) repeated action of intensive vibration produced a considerable drop of sugar and glycogen blood content in dogs.

A64-80726

CIRCADIAN RHYTHMICITY IN THE SENSITIVITY OF TWO STRAINS OF MICE TO WHOLE-BODY RADIATION.

Donald J. Pizzarello, Daniel Isaak, Kian Eng Chua (Bowman Gray School of Med., Dept. of Radiol., Winston-Salem, N.C.), and A. Leonard Rhine (Bowman Gray School of Med., Dept. of Preventive Med., Winston-Salem, N.C.)

Science, vol. 145, Jul. 17, 1964, p. 286-291. 15 refs.

Grant No. PHS-G-CRT-5069; and Am. Cancer Soc.

When male mice of the Swiss-Webster and C₃H strains are maintained on a light-dark cycle in which the light begins at 7 a.m. and ends at 7 p.m., they are more sensitive to whole body X-irradiation of 800 to 900 roentgens (r) given at 2 a.m. than at any other time in the cycle tested. Sensitivity is measured by the subsequent longevity of the irradiated animal. The least sensitivity occurred when mice were irradiated at about 7 a.m. to 7 p.m. A second study of Swiss-Webster mice consisting of groups composed of a male, female, and the litter of young were treated with 800 r and similar results were obtained as with the male mice alone. The circadian rhythm of sensitivity should now be correlated with other rhythms of physiologic activity, and this could lead to providing a physiological basis of sensitivity.

A64-80727

COGNITIVE STRUCTURING, FIELD DEPENDENCE-INDEPENDENCE, AND THE PSYCHOPHYSIOLOGICAL RESPONSE TO PERCEPTUAL ISOLATION.

Charles M. Culver, Sanford I. Cohen, Albert J. Silverman, and B. M. Shmavonian (Duke U. Med. Center, Dept. of Psychiat., Durham, N.C.)

IN: RECENT ADVANCES IN BIOLOGICAL PSYCHIATRY, VOL. VI: THE PROCEEDINGS OF THE EIGHTEENTH ANNUAL CONVENTION AND SCIENTIFIC PROGRAM OF THE SOCIETY OF BIOLOGICAL PSYCHIATRY, ATLANTIC CITY, N. J., JUN. 7-9, 1963.

Edited by Joseph Wortis.

New York, Plenum Press, 1964, p. 119-128. 8 refs.

Grant No. AF-AFSR-57-63.

Twenty-four subjects, half of whom were body-oriented (average error of 20° or less on the rod-and-frame test) and half field-oriented (average error 80° or more on the same test), underwent two hours of perceptual isolation in structured and nonstructured settings. Spatial-perceptual ability was measured before and after isolation experience. Both groups showed more nonspecific fluctuations in skin resistance (GSR) when undergoing the low-information experimental condition than the high-information control condition. Field subjects in low-information setting and body subjects in high

information setting showed a higher heart rate than their respective counterparts. These physiological differences are discussed in terms of possible different patterns of physiological arousal in the two groups. Field subjects performed significantly more poorly than the body subjects on three tests of spatial-perceptual ability. Reforming the subjects into two new extreme groups based on their spatial-perceptual performance accentuated differences in GSR and heart rate.

A64-80728

CARDIORESPIRATORY RESPONSE OF VERY OBESE SUBJECTS TO TREADMILL EXERCISE.

David J. Turell, Robert C. Austin, and James K. Alexander (Ben Taub Gen. Hosp., Cardiovascular Lab.; and Baylor U. Coll. of Med., Dept. of Med., Houston, Tex.)

Journal of Laboratory and Clinical Medicine, vol. 64, Jul. 1964, p. 107-116. 70 refs.

Grant No. PHS-G-HE-03006; and Am. Heart Assoc. and the Houston Heart Assoc. grants.

Cardiorespiratory response to treadmill exercise was assessed in 12 normal and 15 very obese subjects. Under the same exercise conditions, the obese group required almost double the oxygen consumption and pulmonary ventilation of the normal group. Mechanical efficiency and oxygen debt in relation to oxygen consumption during exercise were similar in the two groups. The increased oxygen consumption of the obese subjects during exercise was predicted by empirical formulas developed from data on normal subjects. Thus, it was demonstrated that the relationships among body weight, walking speed, and oxygen consumption in the obese group were essentially the same as those obtained in normal subjects. For comparable increment in energy expenditure as indicated by the change in oxygen uptake with exercise, obese subjects achieved equivalent increases in ventilation with higher respiratory frequencies and lower tidal volumes.

A64-80729

THE EFFECT OF FORCED EXERCISE ON BODY TEMPERATURE AND AMPHETAMINE TOXICITY.

Mervyn G. Hardinge and Donald I. Peterson (Loma Linda U., School of Med., Dept. of Pharmacol., Calif.)

Journal of Pharmacology, vol. 145, Jul. 1964, p. 47-51. 14 refs.

Grant No. NIMH-G-MH-06-347-02.

The rise in body temperature of isolated mice whose motor activity is increased by forced exercise is as great as that of aggregated animals, and both groups are significantly greater ($P < .001$) than in nonexercised isolated animals receiving the same dose of amphetamine or in untreated mice forced to exercise. Thus hyperthermia, and the associated mortality in amphetamine poisoning in mice, appears to be due to a combination of increased motor activity and impaired temperature regulation. Since the increase in toxicity of amphetamine in isolated mice forced to exercise is as great as that of aggregation, it is suggested that "aggregation effect" of amphetamine is primarily due to increase in body temperature caused by an increase in motor activity. The protection offered by chlorpromazine to aggregated mice is probably due both to diminished sensory perception, which prevents increased motor activity, and to its hypothermic effect.

A64-80730

CARBON TETRACHLORIDE HEPATOTOXICITY: THE DIRECT ACTION OF CCl₄ ON THE LIVER.

Murray Heimberg, Mary Louise Watkins, and Roslyn Tooker (Vanderbilt U. School of Med., Dept. of Pharmacol., Nashville, Tenn.)

Journal of Pharmacology, vol. 145, Jul. 1964, p. 92-101. 66 refs.

Grants No. PHS-G-1-R01-OH-00117-01, PHS-G-AM-01677-06, and AHA-G-61-G97.

Carbon tetrachloride (CCl₄), when injected directly into the portal venous cannula of an isolated perfused rat liver, inhibited the net outward transport of hepatic triglycerides. This effect of CCl₄ appears to be reversible and dose-dependent. The hypothesis that CCl₄ poisoning exerts its hepatotoxic action via adrenomedullary discharge of catecholamines and stimulation of sympathetic autonomic nerves to the liver appears to be untenable since (1) the isolated perfused liver cannot be affected in such a manner; (2) adrenergic blocking agents and reserpine do not block the inhibitory effect of CCl₄ on triglyceride release; and (3) both epinephrine and norepinephrine inhibit fatty acid uptake, decrease hepatic blood flow, and stimulate glucose release by the liver—actions which are not elicited by CCl₄. These observations are discussed with reference to current knowledge concerning the mechanism of production of fatty liver and hepatic necrosis in CCl₄ intoxication.

A64-80731

ELECTROCARDIOGRAPHIC TELEMETRY IN SKIERS: ANTICIPATORY AND RECOVERY HEART RATE DURING COMPETITION.

John S. Hanson and Burton S. Tabakin (U. of Vt. Coll. of Med., Dept. of Med., Cardiopulmonary Lab.; and Mary Fletcher Hosp., Burlington)

New England Journal of Medicine, vol. 271, Jul. 23, 1964, p. 181-185. 15 refs.

GRANT No. PHS-G-HE-06121-02.

Modern miniaturized electronic equipment such as FM radio transmitters now permit unhampered monitoring of physiologic phenomena during a wide variety of exercise situations. The RKG-100 radioelectrocardiograph manufactured by Telemedics, Inc., Southampton, Pa., is used in this study. This device consists of a transistorized, battery-powered frequency-modulated transmitter, 2.5 by 9.0 by 11.4 cm. in size and weighing 282.5 grams, and the receiver, measuring 20.3 by 30.5 by 35.6 cm., with a weight of 7.7 kilograms. As an indicator of the data to be gained from the application of such instrumentation to physical exercise, the anticipatory and recovery heart rates recorded during competitive skiing are presented.

A64-80732

EFFECT OF EXERCISE ON THE PERIPHERAL UTILIZATION OF GLUCOSE IN MAN.

Charles A. Sanders, Gilbert E. Levinson, Walter H. Abelmann, and Norbert Freinkel (Boston City Hosp., Mass.; and Harvard Med. School, Dept. of Med., Boston, Mass.)

New England Journal of Medicine, vol. 271, Jul. 30, 1964, p. 220-225. 31 refs.

Natl. Inst. of Arthritis and Metabolic Diseases Grants No. (A-1571) and (2 A-5060); and Life Insurance Med. Res. Fund Grant.

Experiments were conducted in four normal subjects during glucose infusions that sustained a steady rate of hyperglycemia and reduced endogenous glucose production, and in two insulin-dependent patients with "juvenile" diabetes in whom fasting hyperglycemia was sustained after withdrawal of insulin. During leg exercises with a bicycle ergometer, arterial plasma glucose was reduced in the normal subjects. Concomitantly, the arteriovenous gradients for glucose in the splanchnic bed and in nonexercising muscles declined whereas arteriovenous gradients in exercising muscle increased. In the diabetic patients, despite rising levels of systemic blood sugar, the exercise augmented the assimilation of glucose by the exercising muscles. Enhanced regional glucose extraction in the normal subjects and in the diabetic patient was maximal in the immediate postexercise period.

A64-80733

CYBERNETICS, HOMEOSTASIS AND A MODEL OF DISEASE.

Gerson Jacobs (Calif. U., School of Med., Dept. of Med., San Francisco). *Aerospace Medicine*, vol. 35, Aug. 1964, p. 726-731. 33 refs.

A cybernetic concept of disease requires a cybernetic analysis of homeostasis. The mechanism of homeostasis is considered to be at least two interrelated feedback loops called an ultrastable system. When the pathophysiology of nephrosis, congestive failure, or diabetes mellitus is applied to the concept of ultrastable systems, a model of disease results which may be described as a tightly joined pattern of ultrastable systems. In diabetes, it is possible to demonstrate that the increased severity of the disease is associated with an increase in the number of tight linkages between the systems. The significance of this cybernetic analysis lies in the contention that the goal of computer medical diagnosis is reduction of the number of necessary programmed variables to the number of essential (physiological key) variables in the human organism.

A64-80734

EFFECT OF EXERCISE ON FREE FATTY ACID LEVELS IN THE PIGEON.

J. C. George and N. V. Vallyathan (Maharaja Sayajirao U., Dept. of Zool., Div. of Animal Physiol., Baroda, India).

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 619-622. 39 refs.

The effect of exercise on the free fatty acid (FFA) levels in the muscle, liver, adipose tissue, and blood in the pigeon was quantitatively studied after the electrical stimulation of the breast muscles. A reduction of FFA in the blood plasma, liver, and adipose tissue was observed after the stimulation of the muscle. On the other hand, an increase in the FFA content of the muscle was noticed. It was found that there is high rate of FFA extraction by the muscle from the blood which in turn is being supplied from the adipose tissue and liver during the activity of the muscle. From the data obtained it is concluded that the skeletal muscles of birds utilize mainly fat during sustained muscular activity. The physiological importance of FFA as substrate for muscular activity is discussed.

A64-80735

BALANCE AND KINETICS OF ANAEROBIC ENERGY RELEASE DURING STRENUOUS EXERCISE IN MAN.

R. Margaria, P. Cerretelli, and F. Mangili (U. of Milano, Lab. of Physiol., Italy).

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 623-628. 17 refs. Italian Nat. Res. Council Grant.

The speed of lactic acid formation in blood has been measured in man as a function of the intensity of exercise and was found to reach a maximum of about 36 mg. lactic acid/liter blood per second, corresponding to about 21.5 kcal (kg./hour), or 0.034 horsepower/kg. The maximum energy release sustained by the lactic acid mechanism is of the order of 45 kcal/(kg./hour), or 0.07 horsepower/kg. The lactacid debt, as measured in man running on a treadmill, seems to be approximately proportional to the energy expenditure: it amounts at most to 0.1 kcal/kg. or about 1.4 liters O_2 for a man weighing

70 kg. The lactacid debt amounts at most to 0.22 kcal/kg. or about 3 liters O_2 for man, on the average. The lactacid oxygen debt contraction is a faster process and it requires 10 to 30 seconds for completion, while the lactacid debt process is completed in about 40 seconds in the most strenuous exercise. Therefore, at the highest workloads, the only energy source available after 40 seconds resides in oxidative processes.

A64-80736

BASE-LINE EFFECTS ON RESPONSE OF STROKE VOLUME TO LEG EXERCISE IN THE SUPINE POSITION.

M. H. Frick and Timo Somer (U. of Helsinki, Wihuri Res. Inst., First Dept. of Med., Cardiovascular Lab., Finland).

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 639-643. 25 refs. Yrjo Jahnsson Found. Grant.

Cardiac output was measured in normal subjects at rest in horizontal position, at rest supine with the legs on the pedals, and during increasing workloads. Leg raising evoked a 19% increase in stroke volume and a decrease in heart rate. Oxygen uptake and arterial-venous oxygen (A-V O_2) difference remained unaltered. In comparing stroke volume at mild exercise with leg-raised resting position, no change occurred in contrast to the significant rise when compared with horizontal position. At mild exercise, cardiac output response was relatively flat, whereas A-V O_2 difference rose sharply. At heavier exercise, cardiac output rose more steeply and was approximately linear to oxygen consumed. Stroke volumes at these loads were significantly higher than levels in both of the resting positions. Ignorance of the effect of leg raising results in misinterpretation of the stroke volume data at low levels of supine exercise when greatly enhanced tissue extraction of oxygen allows smaller blood flow increments.

A64-80737

CONTINUOUS MEASUREMENT OF VENTILATORY EXCHANGE RATIO DURING EXERCISE.

Arnold Naimark, Kariman Wasserman, and Malcolm B. Mc Ilroy (U. of Calif. School of Med., Cardiovascular Res. Inst., Dept. of Med., San Francisco, and Stanford U. School of Med., Palo Alto, Calif.)

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 644-652. 33 refs.

Grants No. PHS-G-HTS-5251, NIH-G-HE-06285, and NIH-G-06591; and Contract No. Nonr-222(55).

The ventilatory gas exchange ratio (R) has been measured continuously during exercise from end-tidal CO_2 and N_2 concentrations recorded with gas analyzers. Studies in normal subjects and patients with different working capacities indicate that the change in R at different levels of work lasting several minutes on an ergometer gives an excellent measure of the balance between oxygen supply and demand in the working muscles. The level of work at which R increases appreciably above its resting level corresponds to the level at which arterial lactate increases and plasma bicarbonate falls. The continuous measurement of R can be readily incorporated into work tests for the assessment of exercise performance in both normal subjects and patients with cardiovascular diseases.

A64-80738

EFFECT OF NEGATIVE-PRESSURE BREATHING ON LUNG MECHANICS AND VENOUS ADMIXTURE.

Tullio Velasquez and Leon E. Farhi (U. of Buffalo School of Med., Dept. of Physiol., N.Y.)

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 665-671. 11 refs.

Contract No. AF 33(616)-6823; and Grant No. PHS-G-2-G-341.

Anesthetized dogs in the supine position show a spontaneous decrease in total respiratory compliance and an increase in venous admixture to the pulmonary circulation. Both these changes can be increased by negative-pressure breathing and reversed by positive-pressure breathing. If the changes in total respiratory compliance are due only to changes in lung compliance and these in turn result directly from the closure of alveoli, the relationship between compliance and inspiratory and expiratory pressure allows the determination of the scatter of opening and closing pressures in the alveoli. The venous admixture measures blood flow through collapsed alveoli, and its relationship to the negative pressure applied indicates the perfusion of the alveoli collapsing with each increment in negative pressure. By studying simultaneously changes in compliance and venous admixture, and using two basic assumptions, the dog's lungs can be described as a system composed of some elements receiving nearly 50% of the ventilation and 20% of the perfusion, relatively unstable mechanically, and having a very high ventilation-perfusion ratio, while the remaining air spaces receive the same ventilation, but 80% of the perfusion.

A64-80739

EFFECT OF EXERCISE ON ZONAL DISTRIBUTION OF PULMONARY BLOOD FLOW.

John Read and K. T. Fowler (Sydney U., Dept. of Med., Australia).

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 672-678. 9 refs.

Redistribution of pulmonary blood flow was studied by means of the cardiogenic oscillations of expired gas tensions in seven normal subjects during exercise in the vertical posture. The results are expressed in terms of $\dot{Q}_r$, the ratio of blood flow per unit of alveolar volume between upper and lower zones of the lungs, and are compared with the response of the same subjects to alveolar hypoxia. In six subjects, $\dot{Q}_r$ rose on exercise by an amount which varied from subject to subject and from day to day, depending on the resting level of $\dot{Q}_r$. A further subject usually failed to increase $\dot{Q}_r$ on exercise. Aminophylline reduced resting $\dot{Q}_r$ in some subjects. It is concluded that the response of $\dot{Q}_r$ to exercise depends on the extent to which active pulmonary vasodilatation occurs. Differences in the response of $\dot{Q}_r$ to exercise, hypoxia, and aminophylline are interpreted in terms of differing initial pulmonary vasomotor tone.

A64-80740

EFFECT OF ALTERATIONS IN END-TIDAL CO_2 TENSION ON FLOW RESISTANCE.

Michael T. Newhouse, Margaret R. Becklake, Peter T. Macklem, and Maurice Mc Gregor (McGill U., Joint Cardio-Respirat. Serv. of the Montreal Children's Hosp., Canada; and Royal Victoria Hosp., Montreal, Canada). *Journal of Applied Physiology*, vol. 19, Jul. 1964, p. 745-749. 26 refs. Grant No. MRCC-MT-1241; and John A. Hartford Found. Grant.

The effect of arterial carbon dioxide tension (PACO_2) on flow resistance and on the mechanical work of ventilating the lung was studied in five normal subjects during sustained voluntary hyperventilation. Hypocapnia caused a consistent increase in flow resistance. Thus, for a minute volume of approximately 30 liters/minute the mean inspiratory flow resistance was 133% greater and the mean respiratory work of ventilating the lungs 68% greater at PACO_2 20-25 mm. Hg compared to values at 45-50 mm. Hg. End-expiratory pressure and compliance were unaffected. Atropine and isoproterenol each markedly diminished the responsiveness of the airways to low PACO_2 levels and, given together, blocked the effect completely. These findings could largely account for the increase in oxygen cost of breathing, and in cardiac output associated with voluntary (i.e., hypocapnic) hyperventilation.

A64-80741

ALVEOLAR CARBON DIOXIDE EQUILIBRIA IN BREATH-HOLDING EXPERIMENTS.

Delbert S. Barth and Ralph W. Stacy (Public Health Serv., Southwestern Radiol. Health Lab., Las Vegas, Nev.) *Journal of Applied Physiology*, vol. 19, Jul. 1964, p. 755-759. 16 refs. Div. of Radiol. Health, Bur. of State Serv., Public Health Serv. supported res.

An investigation was made of the equilibria approached by alveolar carbon dioxide tension in normal human subjects during breath holding. A major objective of this work was to test the hypothesis that the approached equilibrium was with deoxygenated venous rather than with oxygenated venous blood. The study included determination of CO_2 tension of expired air by continuous recording before and after breath holding for various time periods, with simultaneous airflow recordings. Pulmonary blood flows were calculated from these data, and were compared with those obtained by an independent rebreathing technique. The findings indicate that the equilibrium approached in the alveolar spaces during breath holding is between the alveolar air and the blood as it enters the pulmonary capillary. This would indicate that CO_2 dumping by passive transfer must precede the uptake of oxygen. Effective pulmonary flows calculated from these data were reproducible and in agreement with those obtained by the rebreathing technique.

A64-80742

EFFECT OF LOW CONCENTRATIONS OF OZONE ON PULMONARY FUNCTION IN MAN.

W. A. Young, D. B. Shaw, and D. V. Bates (McGill U., Royal Victoria Hosp., Joint Cardiorespirat. Serv., Montreal, Canada). *Journal of Applied Physiology*, vol. 19, Jul. 1964, p. 765-768. 21 refs. Defence Res. Board of Canada Grant No. 9310-84; and John A. Hartford Found. of U.S.A. Grant.

Eleven subjects in 16 experiments breathed 0.6 to 0.8 p.p.m. of ozone through a mouthpiece for two-hour periods. Measurements of pulmonary function were made immediately before and after each experiment. The changes were compared with those observed after a control experiment in which air was breathed through the same circuit for a similar period. In this concentration, ozone was found to produce a highly significant reduction in steady-state diffusing capacity for carbon monoxide (DL_{CO}) of 5.4 ml. $\text{CO}/\text{minute mm. Hg}$, a change about four times larger than that of the air control experiments. The vital capacity, $\text{FEV}_{0.75} \times 40$, and maximal midexpiratory flow rate decreased by about 10% after ozone breathing, the change being statistically significant in the first two of these only. Gas distribution, and dynamic and static pulmonary compliance were measured in two subjects and were not affected by ozone. Thickening of the alveolar wall by edema fluid is suggested as the most likely explanation of the fall in DL_{CO} that has been observed. The vital capacity and expiratory flow rates may be limited in part by tracheobronchial irritation that follows inhalation of 0.6 p.p.m. of ozone for two hours.

A64-80743

CATECHOLAMINE EXCRETION AND PERFORMANCE DURING STRESS. Marianne Frankenhauser and Paula Patkai (Stockholm U., Psychol. Lab., Sweden).

Perceptual and Motor Skills, vol. 19, Aug. 1964, p. 13-14. Swedish Med. Res. Council Grant.

Urine samples were collected from 110 college students after a rest period and after a work period, each of 90 minutes duration. The work consisted of two parallel series of three tests, involving coding and proofreading tasks and requiring sustained concentration. During the performance of the second series, various stressors were introduced, namely workshop noise, and criticism of intervening work with no solution. Coefficients of correlation were calculated between the measures of performance change and the catecholamine excretion. Improvement of performance during stress was positively correlated with the amount of noradrenaline excreted during the work period. Subjects who improved their performances most during stress also showed the largest increase in noradrenaline excretion over their baseline values.

A64-80744

EXTRA-OCULAR FEEDBACK IN BINOCULAR RIVALRY.

Joseph H. McFarland *Perceptual and Motor Skills*, vol. 19, Aug. 1964, p. 56. Grant No. NIH-G-M-6403-(A).

Binocular rivalry was induced by having the subjects view stereoscopically red vertical and green horizontal bars of a cross. Aftereffects of scanning were induced by having the subjects with their eyes closed scan vertically for 30 seconds in one condition and horizontally in the other condition before exposure of test stimuli. The results support in part the hypothesis that retinal stimulations which "match" extraocular feedback are enhanced in visibility.

A64-80745

CONSISTENCY OF INDIVIDUAL DIFFERENCES IN TIME JUDGMENTS. George Spivack and Murray Levine (The Devereux Found. Inst. for Res. and Training, Devon, Pa.)

Perceptual and Motor Skills, vol. 19, Aug. 1964, p. 83-92. 18 refs. Grant No. NIH-G-M-4531.

Thirty normal male adolescents were asked to produce periods of 1, 8, 16, and 64 seconds spontaneously, by counting at a rate of one count per second, by visualizing a sweep second hand on a clock, and by just "feeling" the time. Significant positive correlations were found within and between methods of producing time, but the correlations within methods were higher, suggesting the method of keeping track of time contributes to the measurement of individual differences. Measures based on very brief intervals, such as 1 second, did not correlate significantly with productions of longer intervals, suggesting productions of longer intervals of time are based on something other than an accumulation of errors of judgment of very brief units of time. A measure of time perspective did not correlate with time productions, suggesting that these two facets of temporal experience belong to different factors or personality processes.

A64-80746

EVIDENCE FOR ACQUIRED EQUIVALENCE OF CUES IN A PERCEPTUAL TASK.

Henry C. Ellis, Robert L. Feuge, K. Kilby Long, and Vernon G. Pegram (New Mexico U., Albuquerque).

Perceptual and Motor Skills, vol. 19, Aug. 1964, p. 159-162. 6 refs. Grant No. NSF-G-23427.

The experiment was designed to test the hypothesis that perceptual performance following various types of stimulus predifferentiation tasks including labeling might depend, not upon the specific features of the labels themselves, but upon differential practice effects presumably associated with the labeling task. Sixty subjects were given a multiple shape recognition test following one of three types of pretraining: distinctiveness, equivalence, or observation practice. In spite of the fact that all groups received comparable amounts of practice with the stimuli, the equivalence group made fewer correct recognitions than did the observation group, a finding which is inconsistent with a differential practice hypothesis and which is consistent with an acquired equivalence of cues hypothesis.

A64-80747

CIRCADIAN ACTIVITY AND NOISE COMPARISONS OF TWO CONFINED GROUPS WITH AND WITHOUT REFERENCE TO CLOCK TIME.

M. L. J. Crawford and D. H. Thor (Ga. U., Athens).

Perceptual and Motor Skills, vol. 19, Aug. 1964, p. 211-216. 10 refs.

The gross behavior of two comparable groups of normal subjects including men, women, and children was measured continuously over a 2-week interval by noise and activity recordings. The second group differed from the first in that no clocks or other mechanical means of recording time were available. Both groups were under relatively identical conditions of isolated confinement in a simulated fallout shelter. Normal cues as to passage of time were not available due to the construction characteristics of the experimental chamber. Thermal and ventilation conditions were maintained at optimal levels. Both measures revealed highly positive correlations between the mean

circadian patterns of the two groups. Noise and activity were also highly correlated within groups. Longitudinal comparisons of daily means revealed slightly decreasing noise trends after the fourth day of confinement. Such a trend was not generally apparent in either of the longitudinal activity plots.

A64-80748

ELECTROENCEPHALOGRAPHIC DEMONSTRATION OF ORTHOSTATIC SYMPTOMS ELEKTROENCEFALOGRAFICKY PRUKAZ ORTOSTATICKYCH OBJEVU.

Antonin Bajer (J. E. Purkyne U., Neurol. Klin., Brno, Czechoslovakia). *Vnitřní lékařství*, vol. 10, 1964, p. 34-41. 19 refs. In Czech.

Orthostatic disturbances were demonstrated by electroencephalographic tracings taken first with the subject in the horizontal, and second, in the vertical position. The change in the electric potential of the brain in the vertical position was either diffuse or hemispheric, i.e., either focal or composite. The most frequent characteristic was slowed activity or marked flattening of the tracing; more rarely sharp activity or accelerated activity was observed. Orthostatic symptoms in the vertical position are due to impairment of the reflex arc which maintains a balance between blood flow to the brain and the rest of the body, mainly the extremities and splanchnic regions. Orthostatic symptoms may be evident in cardiovascular, pulmonary, blood, endocrine, and nerve diseases, also in allergy, especially after exposure to effort, operations, starvation, unhygienic surroundings, menstruation, or other similar stresses.

A64-80749

THE EFFECT OF CHRONIC EXPOSURE TO INDUSTRIAL POISONS ON THE EEG IN MAN [O UCINKU CHRONICKEHO PUSOBENI PRUMY-SLOVYCH JEDU DA ELEKTROENCEFALOGRAM CLOVEKA].

B. Roth and E. Klímková-Deutšchová (Karlova U., Prague, Czechoslovakia). *Ceskoslovenská neurologie*, vol. 27, 1964, p. 41-47. 31 refs. In Czech.

Clinical and electroencephalogram (EEG) examinations were carried out on 56 patients chronically exposed to industrial toxic substances. Ten of these patients worked with heavy metals (mercury, lead, manganese), 14 with styrene, 10 with trichlorethylene, 9 with methylchloride, and another 13 with various other substances including carbonic disulphide, tetrachloromethane, petrol, carbon monoxide, and prussic acid. All patients complained of symptoms and objective signs of intoxication or preintoxication were found in 46% of the patients presenting abnormal EEGs. This abnormality was only slight in 12, of medium severity in 13, and severe in 3 cases. The most frequent finding consisted in diffuse theta waves mainly in the frontal region. At times episodes of theta waves could be found. These changes were mostly found at rest and were made even clearer by hyperventilation. Alpha rhythm was either irregular or completely absent. In some cases sharp waves and focal theta activity could be found localized almost exclusively in the temporal and frontotemporal region. In 32% of the recordings sleep activity was present. Both clinical analysis and EEG findings suggest that the symptoms of the patients are due to the chronic effect of industrial poisons on the central nervous system. The importance of EEG for early diagnosis is stressed.

A64-80750

CHRONIC BENZENE INTOXICATION [CHRONICKÁ OTRAVA BEN-ZENEM].

Heinz Thiele (Deutsches Zentralinstitut für Arbeitsmedizin, Inst. für Berufskrankheiten, Berlin, Germany).

Pracovní lékařství, vol. 16, 1964, p. 1-8. 13 refs. In Czech.

A picture of chronic benzene poisoning is presented indicating differences in susceptibility between men and women. In benzene poisoning the following components may be differentiated: (1) inhibited maturation and division of the blood formation (radiomimetic effect), (2) a facultative megaloblastoid picture, (3) vitamin C deficiency without signs of scurvy, and (4) toxic damage of the capillaries and excessive bleeding. Early hematological signs of the intoxication in men and women are described. The same picture has been produced experimentally in animals. Folic acid (less markedly also ascorbic acid) prevented the development of megaloblastoidia and cysteine prevented hypoplasia of the bone marrow. The concomitant administration of cysteine and folic acid, however, cancel their favorable effect. Initial staphylococcal infections have also a favorable effect, perhaps because of their protective action on vitamin C.

A64-80751

EFFECT OF CHRONIC OXYGEN WANT ON THE ACTIVITY OF THE BLOOD SERUM OF ALBINO RATS THROUGH SEVERAL GENERATIONS [VLIIANIE KHROICHESKOGO KISLORODNOGO GOLODANIYA NA GEMOPOETICHESKUIU AKTIVNOST' SYVOROTKI KROVI BELYKH KRYV V RIADU POKOLENIY].

V. I. Volkovich (Akad. Nauk SSSR, Inst. Fiziol. Im. I. P. Pavlova, Leningrad, USSR).

Fiziologicheskii Zhurnal SSSR, vol. 50, Apr. 1964, p. 496-501. 29 refs. In Russian.

Thirteen generations of white rats were kept in airtight chambers in which the air was maintained at mixtures of 89.5% N₂ and 10.5% O₂ under

standard atmospheric pressure. CO₂ and moisture were removed by absorption. Hypoxia was maintained for 12 hours, followed by 12 hours of exposure to normal atmosphere. Hemopoietic activity of blood plasma was determined by the cell migration index of a leucocyte film culture in a hanging drop preparation. Normal animal control was maintained. The results indicated the presence of a hemopoietic factor in the normal blood plasma stimulated by continuous oxygen deprivation. Normalization was achieved after one month of exposure to normal atmosphere.

A64-80752

HYPOXIC EFFECTS ON ELECTRICAL ACTIVITY OF THE CEREBRAL CORTEX AND ON EXCITABILITY OF CAROTID SINUS CHEMORECEPTORS UNDER DIFFERENT CONDITIONS OF OXYGEN DIFFUSION [VLIIANIE GIPOKSII NA ELEKTRICHESKUIU AKTIVNOST' KORY GOLOVNOGO MOZGA I NA VOZBUDIMOST' KHIMIORETSEPTOROV KAROTIDNOGO SINUSA PRI RAZLICHNYKH USLOVIYAKH DIFFUZII KISLORODA].

I. Bachu, M. Doroftei, L. Tomush, V. Sholtuz, and P. Derevenko (Rumanian People's Republic Acad. of Sci., Cluj Branch, Inst. of Med. Res.; and Medico-Pharm. Inst., Dept. of Physiol., Cluj, Rumania).

Fiziologicheskii Zhurnal SSSR, vol. 50, Mar. 1964, p. 259-267. 32 refs. In Russian.

In true polycythemia, disturbances of oxygen diffusion in the brain centers are reflected in the EEG by appearance of fast beta-waves superimposed by occasional slow waves. During hypoxia, faster EEG changes, higher oxygen concentrations in the exhaled air, and lower saturation of the arterial blood were observed in the polycythemic, than in the normal subjects. These findings indicate the presence of a pathogenic mechanism, which causes a suppression of oxygen diffusion from the blood stream into the brain centers regulating the hemopoiesis. Results of experiments on parabiotic animals indicate that during hypoxia a decrease in the rate of diffusion of oxygen from the blood stream into the sinocarotid chemoreceptors, caused by the thickening of the fibrin film formed on the blood vessel walls of the carotid sinuses, leads to a weakening of the activity of the respiratory reflexes.

A64-80753

CHANGES IN RESPIRATION AND REFLEX EXCITABILITY OF THE RESPIRATORY CENTER IN DOGS INHALING OXYGEN [IZMENENIYA DYKHANIYA I REFLEKTORNOI VOZBUDIMOSTI DYKHATEL'NOGO TSENTRA U SOBAK PRI VDYKHANII KISLORODA].

G. A. Vakaleiger and L. F. Yerenenko (Med. Inst., Dept. of Physiol., Orenburg, USSR).

Fiziologicheskii Zhurnal SSSR, vol. 50, Mar. 1964, p. 280-287. 27 refs. In Russian.

Dogs were placed in a ventilation chamber, and the reflex excitability of the respiratory centers was determined by the response to an electric current of the vagus which had been isolated on a skin flap of the neck. The excitability threshold was determined by the minimal cough. An increase in oxygen tension resulted in changes of respiratory rate, of rhythm, and of volume. The initial effect was on intercostal muscle activity with complete suppression in some cases. Less effect was observed on the respiratory rate. Prolonged exposure led to normalization of rhythm and amplitude. The threshold of the reflex excitability of the respiratory centers was not shifted in the majority of cases. The effect of chloral hydrate and aminazin (chlorpromazine) is also described.

A64-80754

A DEVICE FOR PICKING UP AN ELECTROENCEPHALOGRAPH DURING PROLONGED ROTATION OF HUMAN SUBJECTS [USTANOVKA DLYA OTVEDENIYA ELEKTROENTSEFALOGRAMMY V PROTSESSE DLITEL'NOGO VRASHCHENIYA CHELOVEKA].

A. A. Marinichev (USSR Acad. of Sci., Inst. of Higher Nervous Activity and Neuropsychiatry, Moscow, USSR).

Fiziologicheskii Zhurnal SSSR, vol. 50, Mar. 1964, p. 381-383. In Russian.

The device consists of two parts: the collector and the pickup. The collector is attached to the rotary shaft between the upper (rotating) and the lower (stationary) parts of the chair. It consists of perforated brass rings, insulated from each other by a thin plate, and from the shaft by an ebony nut. Brass pins passing through the rings are connected with the electrodes located on the back of the chair. The pickup device is attached to the stationary part of the chair and connected to an amplifier. The device is considered to be interference free.

A64-80755

PSYCHOSOMATIC OCULAR PHENOMENA IN AVIATION MEDICINE [LES AFFECTIONS PSYCHO-SOMATIQUES OCULAIRES EN MEDECINE AERONAUTIQUE].

G. Perdriel.

Revue des corps de santé des armées terre mer air, vol. 4, Oct. 1963, p. 601-610. In French.

The numerous anatomical and humoral correlations existing between the eye and brain account for the psycho-ocular interactions frequently originating from a diencephalic disorder, which plays an important role in the manifestations of emotional states. Psychosomatic diseases in ophthalmology are relatively few. They are classified as eye diseases where no pathological explanation is found. In the pilot, central angiospastic retinopathy may be caused by intense operational fatigue, difficult mission, social conflict, etc. Spatial myopia seems to be a physical phenomenon which appears under the dependence of affective disorders created by high altitude flight conditions. Visual fatigue may also originate from emotional factors. Glaucoma is found in 2.7% of the pilots over 40 years of age; civilian pilots have a 1.6% incidence and jet pilots a 3.8% incidence indicating that the psychological stress of the latter specialty favors development of the disease. Diagnosis and treatment of psychosomatic ocular diseases in the aviator are of interest to both the psychologist and ophthalmologist. Chemotherapy or psychotherapy may be used in treatment of these diseases.

A64-80756

QUALIFICATIONS OF THE FLIGHT SURGEON.

G. B. Mc Neely (St. Joseph's Hosp., Dept. of Aerospace Med., Bloomington, Ill.)

Illinois Medical Journal, vol. 126, Jul. 1964, p. 49-51.

The author presents his opinions of what is the role of the flight surgeon and his qualifications to do the job. The flight surgeon's role is to say who can fly, how he can fly with safety, and to correct difficulties occurring in connection with flight activities. Although the flight surgeon cannot be expected to be a specialist in everything he should have a broad training in the fields of medicine and various aspects of engineering. He should comprehend the principles of aeronautical and astronautical flight and how pilot activities are related to these. He should be familiar with airfield facilities and flight control operations from the ground. The author believes that the flight surgeon should have more than a superficial knowledge of medical specialties, and he reviews the various fields of medicine pointing out important aspects that concern the flight surgeon. The author urges that all flight surgeons remain current in their knowledge by attending postgraduate courses and making use of the various aeromedical societies.

A64-80757

AIR TRANSPORTATION OF PATIENTS WITH PULMONARY DISEASE.

Earl T. Carter and Matthew B. Divertie (Mayo Found. for Med. Educ. and Res., Rochester, Minn.)

Medical Clinics of North America, Vol. 48, Jul. 1964, p. 887-895. 15 refs.

Problems relating to pulmonary disease and air transportation are reviewed. Physiological and clinical aspects of these problems are considered. The author concludes the following: (1) no patient with major cardiopulmonary disease should be exposed to an altitude higher than 8,000 feet; (2) cor pulmonale imposes a similar restriction, and markedly reduced respiratory reserve accompanied by tachycardia at ground level is an unfavorable prognostic index for even short-term exposure to moderate cabin altitudes; and (3) although acute respiratory illness represents a contraindication to travel by air (unless other medical factors require it), the transport of patients with chronic respiratory disease demands an evaluation of the physiological status. Pulmonary function tests provide objective measurements of the derangements. In particular, the peripheral arterial oxygen saturation and the maximum breathing capacity are of major importance in assessing the presence and degree of hypoxemia and the ability of the patient to hyperventilate. If facilities for such tests are not available, the physician must depend on the more traditional clinical examination of the patient.

A64-80758

SUPPLEMENTARY FEEDBACK IN ROTARY-PURSUIT TRACKING.

Ina M. Bilodeau and Henry S. Rosenquist (Tulane U., New Orleans, La.)

Journal of Experimental Psychology, vol. 68, Jul. 1964, p. 53-57. 10 refs.

Procedures of previous experiments were replicated to test whether sampling error or procedural differences accounted for one report that an extra on-target cue facilitated rotary-pursuit performance and another that an extra cue had no effect. One hundred and two subjects practiced in a three-group design. After five pretest trials differential training was carried out for 50 trials in which subjects received either (a) a 0.1 second buzzer signal for staying continuously on target for 0.5 seconds, (b) a continuous buzzer signal for as long as the subject stayed continuously on target for more than 0.5 seconds, or (c) no supplementary feedback. Differential training failed to produce differences either during the training period or in a 10-trial transfer test without the buzzer. It was concluded that rotary-pursuit performance is not sensitive to supplementary feedback.

A64-80759

SOME PROBLEMS OF THE ADAPTATION OF THE ORGANISM TO CHRONIC OXYGEN DEFICIENCY (IDEIAMI PYTANNIA AKLIMATY-ZATSIH ORGANISMU DO KHROICHNOHO KYNEVOHO HOLODU-VANNIA).

V. I. Voltkevich (Acad. of Sci. of the USSR, I. P. Pavlov Inst. of Physiol., Therap. Section, Moscow, USSR).

Fiziologichnyi Zhurnal, vol. 10, May-Jul. 1964, p. 360-366. 27 refs. In Ukrainian.

In seven generations of white rats subjected to hypoxic conditions in closed chambers for one month, the blood supply to the brain increased by 46% and persisted 3 to 6 months after the animals' gradual return to normal atmosphere. The erythrocyte count and hemoglobin concentration of the peripheral blood showed higher values under hypoxia. A dissociation curve shift was noted in the second generation and progressed in each successive generation. The hematopoietic factor in the blood plasma showed a progressive rise. Similar red count and hemoglobin increases were noted in human subjects during ascents to 2,000-4,200 meter altitude. An increase in the plasma hematopoietin concentration was found 10 to 15 days after the descent, and tests taken 10 days later still registered a slight increase. A month later, values were slightly below normal.

A64-80760

RELATIONSHIP BETWEEN PERCEPTUAL-MOTOR DEFICITS IN SLEEP DEPRIVATION AND CHRONIC SCHIZOPHRENIA.

Elliot D. Luby, Gerald Rosenbaum, James L. Grissell, Bertram Cohen, and J. S. Gottlieb (Wayne State U., Detroit, Mich.)

IN: RECENT ADVANCES IN BIOLOGICAL PSYCHIATRY, VOL. VI: The Proceedings of the Eighteenth Annual Convention and Scientific Program of the Society of Biological Psychiatry, Atlantic City, N. J., Jun. 7-9, 1963. Edited by Joseph Wortis.

New York, Plenum Press, 1964, p. 88-95. 11 refs.

Ten paid volunteers underwent 120 hours sleep deprivation. All subjects were given the pursuit rotor test one day prior to sleep deprivation, once each day of the experiment, and two days following sleep. Four subjects were given the reversed-digits writing task prior to sleep deprivation, at 48 and 72 hours of wakefulness, and one day following sleep. For comparison 15 chronic schizophrenics and 11 normal controls were also tested on the reversed-digits writing task. Chronic schizophrenics and sleep-deprived normals show markedly impaired perceptual-motor functioning on tasks requiring continuous work output. Sleep deprivation periods of 72 to 100 hours are necessary to produce serious impairment in work output comparable to that observed in chronic schizophrenics after a short (12 minutes) work period. Measurements of energy-transfer systems in both chronic schizophrenia and sleep deprivation indicate that these conditions are both energy deficit states. A hypothesis is suggested relating the development of reactive inhibition to temporary depletion of high-energy phosphate in the neuronal systems mediating a given perceptual-motor response.

A64-80761

THE NEUROPHYSIOLOGICAL ACCOMPANIMENTS OF SENSORY AND SLEEP DEPRIVATION AND THEIR ROLE IN THE PRODUCTION OF PSYCHOLOGICAL DISTURBANCES.

Wagner H. Bridger (Albert Einstein Coll. of Med., New York, N.Y.)

IN: RECENT ADVANCES IN BIOLOGICAL PSYCHIATRY, VOL. VI: The Proceedings of the Eighteenth Annual Convention and Scientific Program of the Society of Biological Psychiatry, Atlantic City, N.J., Jun. 7-9, 1963. Edited by Joseph Wortis.

New York, Plenum Press, 1964, p. 105-110. 29 refs.

Grant No. PHS-G-M-2249.

A survey of the neurophysiological correlates of sleep and sensory deprivation indicates that they share common features with drowsiness and light sleep. Animal studies suggest that the neocortical inhibition present in sleep is accompanied by episodes of limbic-system activation. Electrophysiological studies of conditioning reveal that the neocortex manifests differential responses to the conditioned and unconditioned stimuli, while the limbic system does not show such differential responses. It is hypothesized that neocortical inhibition and limbic-system excitation will interfere with reality testing by decreasing the distinction between the symbol and the object symbolized.

A64-80762

NEWER CONCEPTS IN THE PATHOPHYSIOLOGY OF EXPERIMENTAL DYSBARISM-DECOMPRESSION SICKNESS.

A. T. K. Cockert and R. M. Nakamura (Harbor Gen. Hosp., Dept. of Surgery (Urology) and Pathol., Torrance, Calif.; and Calif. U., School of Med., Los Angeles).

American Surgeon, vol. 30, Jul. 1964, p. 447-451. 7 refs.

Grant No. AF-AFOSR-61-81.

A technique for the production of gaseous bubbles in dogs is described. Plasma volumes decreased an average of 20.3% of pre-chamber control values two to three hours after removal of six dogs from the decompression chamber. Red blood cell volumes did not change. The role of bubble formation with progressive reduction in blood pressure is discussed. Histologic changes in the brain, lung, kidney, and liver are mentioned. Bone marrow emboli were not found on routine histologic sections of the lung. Fat droplets were found in all major organs except the brain.

A64-80763**PROTECTION OF VIBRATED RATS EXPOSED TO EXPLOSIVE DECOMPRESSION.**

Donald E. Furry (U.S. Naval School of Aviation Med., Naval Aviation Med. Center, Pensacola, Fla.)

Aerospace Medicine, vol. 35, Aug. 1964, p. 773-775. 12 refs.

Tolerance of restrained Sprague-Dawley male rats to explosive decompression from sea level to 40,000 feet in approximately 0.01 second is markedly reduced when the animals are previously exposed to 30 minutes of whole-body mechanical vibration of 25 c.p.s. frequency and 0.25 inch displacement (peak to peak). The administration of an intraperitoneal injection of 1.0 ml. of 2% Lidocaine HCl, however, effectively increases this tolerance. Major pathologic findings were confined to the lungs and consisted of gross and histological evidence of pulmonary hemorrhage, edema, and atelectasis.

A64-80764**PHYSIOLOGICAL REACTIONS OF CAUCASIAN AND BANTU MALES IN ACUTE EXPOSURE TO COLD.**

C. H. Wyndham, J. S. Ward, A. Munro (Transvaal and Orange Free State Chamber of Mines, Appl. Physiol. Lab., and Math-Statist. Div., Johannesburg, South Africa) et al.

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 583-592. 11 refs.

Eleven men per sample of Caucasian and Bantu males were exposed for 2 hours in a climatic chamber at various air temperatures ranging from 5° to 27° C., and a wind velocity of 80 to 100 feet/minute. When expressed per square meter surface area the metabolism of the Bantu was greater in the range above 18° C. and below 6° C. Average skin temperatures were similar for both groups, but between 27° and 17° C. the toe and finger temperatures of the Caucasians were significantly higher than that of the Bantu—the difference at 27° C. being 5° C. for the fingers and 3.6° C. for the toes. Rectal temperatures of both groups were similar between 27° and 17° C. With the rectal temperatures at 27° C. air temperature as the criterion, it was found that as the air temperatures decreased below the 27° to 17° C. range the rectal temperatures of the Bantu fell linearly, while the rectal temperatures of the Caucasians rose steadily.

A64-80765**RELATIVE CONTRIBUTIONS OF THE RIB CAGE AND THE DIAPHRAGM TO VENTILATION IN MAN.**

Edward H. Bergofsky (N. Y. U. School of Med., Dept. of Phys. Med. and Rehabil. and Dept. of Physiol., N.Y.)

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 698-706. 12 refs. *Health Res. Council of the City of New York Grant No. U-1249.*

A plethysmographic method was used to partition the tidal volume into two components: that due to rib-cage expansion and that due to diaphragmatic descent. In 15 normal subjects, one-third of the tidal volume was effected by diaphragmatic descent during various situations, i.e., at rest, voluntary respiratory maneuvers, and breathing special gas mixtures. This technique was combined with measurements of intra-abdominal pressure changes in order to measure the extrapulmonary work of breathing (rib cage plus diaphragm) measured by passive ventilation in a body respirator, indicating that the rib cage requires no work to move itself until tidal volumes greater than 1 liter are reached.

A64-80766**REPRODUCIBILITY OF TRANSIENT RESPONSE TO CO₂ INHALATION IN MAN.**

D. J. C. Read, J. E. Maloney, and K. T. Fowler (Sydney U., Dept. of Med., Australia).

Journal of Applied Physiology, vol. 19, Jul. 1964, p. 750-754. 5 refs. *Consolidated Med. Res. Fund of the U. of Sydney and Joint Coal Board of New South Wales supported res.*

The transient changes in ventilation and alveolar carbon dioxide tension (P_{CO₂}) following the inhalation of 4% carbon dioxide and the return to air have been studied in five normal subjects in an attempt to characterize the intact respiratory chemostat in man. In all 13 studies the changes of ventilation lagged behind those of alveolar P_{CO₂}, while the latter consistently over- or undershot its later steady-state value. The timing and magnitude of the responses were in general agreement with the predictions made by Grodins et al., who assumed in their model that the chemoreceptors respond to a single stimulus (P_{CO₂}) and are embedded in tissue in equilibrium with venous blood. In four duplicate experiments on individual subjects the quantitative reproducibility of the transients was poor, due largely to cyclic and random variations of ventilation shown by all subjects, even when in the steady state. Studies performed during mild hypoxia revealed no change in transient response.

A64-80767**THE EFFECT OF PROLONGED STARVATION ON ADRENAL CORTICAL FUNCTION.**

Robert S. Neuwirth, Betty Anne Philip, and Philip K. Bondy (Yale U., School of Med., Dept. of Med., New Haven, Conn.)

Yale Journal of Biology and Medicine, vol. 36, Jun. 1964, p. 445-454. 15 refs.

Two normal men and a normal woman fasted for seven days. During the fasting period, the excretion of 17-ketosteroids and 17-ketogenic steroids was reduced; however, the proportions of the various steroids of both categories in the urine were unchanged. The plasma cortisol concentration rose in each instance, and was associated with increased protein binding of the steroid in the single instance where this was measured.

A64-80768**MEDICAL ASPECTS OF THE EJECTIONS THAT TOOK PLACE ON THE MIRAGE III [ASPECT MEDICAL DES EJECTIONS SURVENUES SUR MIRAGE III].**

J. Fabre and J.-M. Balabaud (Centre d'Enseignement et de Recherches de Med. Aeron., Paris, France).

Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 565-569. In French.

The sequence of events which take place in automatic pilot ejection in Martin Baker AM4 seats are described. The seat has a maximum acceleration of 19 g. Eight specific pilot ejections are cited: six landed intact; one was inappropriately seated and injured; and the single death was attributed to factors other than seat function. Most of the pilots ejected at low speed and at low altitude. In a study of 200 previous ejections, it was determined that the weight of the pilot is not a critical factor in injury. It is concluded that the seat is a safe one for pilot ejection.

A64-80769**CORONARY DISTURBANCES AND FLYING [TROUBLES CORONARIENS ET NAVIGATION AERIENNE].**

F. Plas, J. Sepetjian, and P. Vesval.

Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 571-579. In French.

The author concludes that heart conditions should be more thoroughly investigated before pilot training. Coronaries and infarctions should not be considered direct hazards of flying since they occur no more often in flying than in nonflying personnel. On the contrary, it is suggested that young men's normal hearts benefit from the coronary vasoconstrictions and vasodilations accompanying anoxia during flight.

A64-80770**COSMIC RAYS—DO THEY REPRESENT A RADIOBIOLOGICAL HAZARD BETWEEN 20 AND 30 KILOMETERS [LES RAYONNEMENTS COSMIQUES PRESENTENT-ILS UN DANGER RADIOBIOLOGIQUE ENTRE 20 ET 30 KILOMETRES?].**

R. P. Delahaye and E. Tabussee.

Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 581-584. 21 refs. In French.

Cosmic rays encountered at an altitude of 20 to 30 kilometers are galactic or solar in origin. The former are not intense enough to be hazardous. The latter, released at the time of solar eruptions, are usually quickly absorbed by the upper atmosphere or attracted by the earth's magnetic field. Neither type of ionizing radiation is intense enough to cause somatic effects, and probably too weak to be carcinogenic.

A64-80771**THE EFFECTS OF HUMIDITY ON INSENSIBLE PERSPIRATION [INFLUENCE DE L'HYGROMETRIE SUR LA PERSPIRATION INSENSIBLE].**

J. Colin and Y. Houdas (Centre d'Essais en Vol, Lab. de Méd. Aéropatiale, Bretigny-sur-Orge, France).

Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 585-588. 22 refs. In French.

Total perspirations of five individuals in 46 experiments were measured at 30° C. with the humidity ranging from 1.4 to 30.7 mm. Hg (water pressure in the surrounding air), and at 33 to 35° C. with surrounding humidity of 36.5 mm. Hg. Exact quantities of water lost by perspiration were measured and found to be constant for each individual, but to vary between subjects. The amount of perspiration was a linear function of the difference between skin and environmental water pressure. The total weight loss consisted of water loss by respiration and through the skin plus metabolic functional loss.

A64-80772**HYPOXIC HYPERVENTILATION AS A LIMITING FACTOR IN EXOGENOUS HYPERCAPNIA [L'HYPERVENTILATION HYPOXIQUE, FACTEUR LIMITATIF DE L'HYPERCAPNIE EXOGENE].**

M. V. Strumza.

Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 589-591. 9 refs. In French.

A group of 18 individuals was subjected to alveolar hyperventilation as a result of isocapnic hypoxia (oxygen pressure of 110 mm. Hg) at rest and while performing light muscular work; the results were compared with controls. The mental facilities of the subjects were not significantly impaired.

No significant difference in oxygen consumption was noted between the groups.

A64-80773

EXTRATERRESTRIAL RADIATION. I. BIOLOGICAL STUDIES (LES RAYONNEMENTS EXTRA-TERRESTRES. I. LES ETUDES BIOLOGIQUES). R. P. Delahaye and E. Tabusse.
Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 593-597. In French.

A summary review is given of experiments on radiation of galactic or solar radiation. The experiments, done on earth, in planes, in rockets, in balloons, and in satellites, involved the following biological materials: mammals, insects, plants, algae, cell cultures, and bacteria. Results of the experiments are briefly described.

A64-80774

MEDICAL SERVICE TASKS OF AN AIR LINE (LES TACHES DU SERVICE MEDICAL D'UNE COMPAGNIE DE TRANSPORTS AERIENS). E. Lafontaine.
Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 621-625. In French.

Flight surgeons for Air-France have charge of three groups: ground personnel, personnel of substations of the airline, and in-flight personnel. Besides preinduction physical examinations, constant maintenance of the personnel, and presence in case of an accident or injury, doctors have charge of vaccinations, space hygiene, and the teaching of courses on emergency use of oxygen masks, high altitude visual disorders, lighting and arrangement of instrument panels, arrangement of seats, problems of noise, ionizing radiation, and pressure, and in-flight emergencies. The six leading physicians of the airline are introduced and the numbers of physicians serving each of the three groups named above are stated.

A64-80775

AIR TRANSPORTATION OF CONGENITAL CARDIAC PATIENTS (LE TRANSPORT AERIEN DES CARDIOPATHIES CONGENITALES). M. Durand and J. Bourdinaud.
Revue de Médecine Aéronautique, vol. 3, Jan.-Feb. 1964, p. 635-641. 42 refs. In French.

Eighty-three patients of different ages (with case histories of six given) were transported by air without any resulting deaths. Flights are contraindicated for individuals not treatable with oxygen or who cannot withstand any stress. Ambulance planes with pressurized cabins, preferably separate from other passengers and personnel, are essential. Medical escorts, oxygen, and comfortable chairs or beds are usually required during flight; and adequate hygienic and dietetic facilities should be available before and after the flight.

A64-80776

CONCENTRATION CHANGES OF SOME HUMAN SERUM ELECTROLYTES AND IRON IN CONSEQUENCE OF PHYSICAL EFFORTS. E. Preisler and R. Kabza (Med. Acad., Dept. of Sport Med., Poznan, Poland).
Bulletin de la Société des Amis des Sciences et des Lettres de Poznan, Série C (Médecine), vol. 13, p. 85-93. 6 refs.

Concentration changes of sodium, potassium, calcium, and iron in human serum were investigated before and after two short duration intensive efforts (200 meter regatta rowing and 400 meter crawl swimming) in 17 well-trained sportsmen between 16 and 32 years old. Examinations were also made of pulse, blood pressure, glucose contents, and lactic acid and alkaline reserve in the blood to control effort intensity. Insignificant serum concentration changes of sodium, frequent decrease of potassium (especially after swimming), and a decrease of calcium (after regatta rowing) were observed. An increase in iron concentration in serum (especially after regatta rowing) was also observed in the majority of the subjects.

A64-80777

EXERCISE TEST DEMONSTRATES CORONARY INSUFFICIENCY. Eliot Corday (Calif. U., Los Angeles), Tzu-Wang Lang, and Vaclav Bazika (Cedars of Lebanon Hosp., Los Angeles, Calif.)
New Physician, vol. 13, Jul. 1964, p. 249.

A 43-year-old patient with precordial distress was revealed to have a blood pressure of 120/80 and a normal resting electrocardiogram upon being examined. However, when a Master double two-step test was performed, the S-T segments immediately became markedly depressed. The T-waves became much higher in Lead II, and two minutes after the two-step test, frequent premature systoles were noted, followed by a run of ventricular tachycardia which persisted for 30 seconds at a rate of 130 per minute. The Master two-step test, considered positive with S-T depressions greater than 1 millimeter, is also considered positive if arrhythmias, such as frequent premature systoles, occur following exercise. The positive Master two-step test indicates that the patient has serious coronary artery narrowing and that the slight amount of exercise overtaxed his coronary circulation.

A64-80778

SYNCHRONOUS AND CONSECUTIVE INFORMATION PROCESSING IN THE VISUAL SYSTEM (OB ODNOVREMENNOI I POSLEDOVATEL'NOI OBRABOTKE INFORMATSII V ZRITEL'NOI SISTEME). V. D. Glezer and A. A. Nevskaja.
Doklady Akademii nauk SSSR, vol. 155, Mar. 1964, p. 711-714. In Russian.

Separate elementary components of the image outline are recognized by an inherent visual mechanism. The visual signals for all components are received simultaneously. Through training and experience these components are combined to form more complex ones. The process of image recognition consists of the unfolding of these components. When several images are present in the field of vision their recognition begins simultaneously. However, the formation of one image must reach a certain level of recognition before the development of the next one. This produces a lag in visual information. It is possible that the actual formation of images takes place simultaneously, but the registration of the information at the final phase is gradual.

A64-80779

TIME PERCEPTION DURING A TWO-WEEK CONFINEMENT: INFLUENCE OF AGE, SEX, IQ, AND TIME OF DAY. D. H. Thor and M. L. J. Crawford (Ga. U., Athens).
Acta Psychologica, vol. 22, 1964, p. 78-84. 10 refs. DOD Contract No. OCD-05-62-226.

Thirty men, women, and children were confined to an experimental chamber (simulated fallout shelter) for 304.6 hours with no mechanical means of determining passage of time. Extrinsic cues (e.g., night and day) to time of day were absent or unknown. Individual estimates of the time of day were made twice daily to determine the relative influence of age, sex, IQ, time of day, and days of confinement upon time perception. Estimate deviations in minutes from true time were evaluated by mixed analyses of variance and trend tests. Results revealed significant time of day, age, and days effects. Sex and IQ effects were not significant.

A64-80780

TIME RELATIONS OF OBJECTIVE AND SUBJECTIVE REACTIONS TO D-AMPHETAMINE AND PENTOBARBITONE. Marianne Frankenhaeuser and Birgitta Post (Stockholm U., Psychol. Lab.; and Karolinska Inst., Lab. of Aviation and Naval Med., Stockholm, Sweden).
Scandinavian Journal of Psychology, vol. 5, 1964, p. 99-107. 9 refs. Swedish Council for Social Science Res. Grant.

Successive measurements of pulse rate, blood pressure, objective and subjective reaction speed, and six mood variables were made on 12 healthy subjects during 135-minute periods following the intake of either 15 milligrams d-amphetamine, 200 milligrams Pentobarbitone, or a placebo. It was shown that (1) the two drugs had essentially opposite effects on all objective and most subjective variables; (2) after d-amphetamine subjective effects appeared earlier and reached their maximum more rapidly than objective effects; (3) both types of reaction were less pronounced after Pentobarbitone than after d-amphetamine under the present dose conditions; and (4) after Pentobarbitone maximum objective effects were attained at an earlier point in time.

A64-80781

MONOCULAR SLANT PERCEPTION AND THE TEXTURE GRADIENT CONCEPT.

E. Sture Eriksson (Uppsala U., Psychol. Lab., Sweden).
Scandinavian Journal of Psychology, vol. 5, 1964, p. 123-128. 7 refs.

Some experiments inspired by the concept of texture gradient were performed with three independent variables: size of elements, distance between elements, and retinal area. The dependent variable was the perceived slant of a surface. All data deviate from those expected on the basis of the gradient concept. An earlier interaction hypothesis has been found to agree rather well with the data. Theoretical problems concerning cue-contra-gradient theory are discussed.

A64-80782

RATE OF LEARNING ON A PURSUIT ROTOR TASK AT A CONSTANT WORK-REST RATIO WITH VARYING WORK AND REST PERIODS. Robert Plutchik (Hofstra U., Hempstead, N.Y.) and Roger D. Pettit.
Perceptual and Motor Skills, vol. 19, Aug. 1964, p. 227-231. 17 refs.

Five groups of subjects were tested on a pursuit rotor, using a constant rest-work ratio of 1:2. The work lengths varied from 40 seconds to 5 minutes; the rest durations from 20 seconds to 2 1/2 minutes. The asymptotic mean rates of performance for the groups showed no significant differences. The implications of this finding for the concept of "massed" and "distributed" learning were discussed.

A64-80783

REACTION TO COLD OF RATS ADAPTED TO INTERMITTENT FEEDING AND FASTING. E. Holeckova (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague).
Physiologia bohemoslovenica, vol. 13, 1964, p. 78-80. 6 refs.

Rats adapted previously to intermittent feeding and fasting were subjected to cold (5°C .) for three weeks. They were fed ad libitum and their weight and food intake were recorded daily. The adapted rats consumed, during the time of exposure to cold, an average of 587 grams of food and gained an average of 33 grams of body weight. Control rats of the same age consumed an average of only 540 grams of food and lost 10 grams of body weight. Young, growing, control rats of the same initial weight consumed an average of 690 grams of food and gained an average of 15 grams of weight. Thus animals adapted previously to intermittent feeding and fasting reacted to cold more favorably than did the controls.

A64-80784

EXTRACELLULAR POLYSACCHARIDES OF ALGAE: EFFECTS ON LIFE-SUPPORT SYSTEMS.

B. G. Moore and R. G. Tischer (Miss. State U., Dept. of Microbiol., State College).

Science, vol. 145, Aug. 7, 1964, p. 586-587. 14 refs.

The amount of extracellular polysaccharide produced by eight species of green and blue-green algae ranges from 174 milligrams per liter to 557 milligrams per liter. Most of the polymers are composed of four monosaccharides: a hexose, a pentose, a methyl pentose, and uronic acid. The production of excessive amounts of these photosynthetic end products will undoubtedly influence the effective recycling time of growth media in life-support systems.

A64-80785

EFFECTS OF EXERCISE AND FOOD RESTRICTION ON SERUM CHOLESTEROL AND LIVER LIPIDS.

Evelyn M. Jones, Henry J. Montoye, Perry B. Johnson, Sister M. John Martin, Wayne D. Van Huss, and Dena Cederquist (Mich. State U., Dept. of Foods and Nutr.; and Dept. of Health, Phys. Educ., and Recreation, East Lansing).

American Journal of Physiology, vol. 207, Aug. 1964, p. 460-466. 54 refs.

Grants No. NIH-G-H4501; and MSU-G-2607.

The effect of 15 weeks of regular, vigorous exercise (swimming) on serum and hepatic cholesterol in rats was studied. The effect of exercise on body composition and the interrelation of body composition and serum and hepatic cholesterol was also investigated. Caloric restriction without exercise was imposed on another group of rats in an effort to produce animals with body composition similar to those subjected to exercise. The caloric-restricted animals were retarded in growth as evidenced by lower ash weight but their body composition on a percentage basis was almost identical to the ad libitum fed animals who were not exercised. It was concluded that: (1) Exercise was effective in preventing most of the increase in body fat and serum cholesterol concentration associated with an increase in age. (2) Neither total nor free cholesterol concentration in the liver was affected by exercise, but the concentration of total hepatic lipids was reduced. (3) Body fat, serum cholesterol, and concentration of total hepatic lipids were all positively correlated with each other and inversely related to weight of the adrenal glands in the animals.

A64-80786

SPACE EXPLORATION.

Edited by Donald P. Le Galley (Space Technol. Center, TRW Space Technol. Lab., Redondo Beach, Calif.) and John W. Mc Kee (Gen. Elec. Co.—TEMPO, Santa Barbara, Calif.)

New York, McGraw-Hill Book Company, 1964, xii+467 p.

This book is based on a series of lectures given under the auspices of the University of California Engineering and Physical Sciences Extension Division. Each lecturer writes the corresponding chapter in the book. The chapters contain information in technology and physical and biological aspects of space. Technological subjects include information on design of reentry vehicles, nuclear propulsion, meteorological satellites, radiation shielding, space navigation, and economic implications. Studies in the physical sciences include chapters on cosmology and relativity, solar flares, astrodynamics, and meteoroids. Chapters of biological interest contain information on planetary environments, man-in-space, radiation shielding, and the origin of life. These chapters are abstracted separately.

A64-80787

THE ENVIRONMENT OF THE PLANETS.

William W. Kellogg (RAND Corporation, Santa Monica, Calif.)

IN: SPACE EXPLORATION.

Edited by Donald P. Le Galley and John W. Mc Kee.

New York, McGraw-Hill Book Company, 1964, p. 83-96. 39 refs.

The author presents a summary of the state of knowledge of the planets pertaining to their environments and the possibility of the existence of life. The data include work done until the summer of 1962. Concentrating on Mars and Venus, the author summarizes environmental data gathered by visual, infrared, and radar observations. Observations indicating some form of plant life on Mars are cited. Data from studies of Venus indicate that life probably does not exist there. It is suggested that the one goal of planetary exploration should be to discover the history of the planets, and that only by close inspection shall the complete nature of these environments be determined.

A64-80788

MAN IN SPACE.

John L. Mason.

IN: SPACE EXPLORATION.

Edited by Donald P. Le Galley and John W. Mc Kee.

New York, McGraw-Hill Book Company, 1964, p. 173-216. 24 refs.

Man's role in space is briefly outlined and the advantages of using man for space operations are discussed. Man's food, water, and environmental requirements are reviewed and analyzed. The need for using freeze-dried food and a closed-cycle water recovery system is stressed. The reutilization of man's waste is also discussed. Environmental requirements such as temperature, pressure, and composition of spacecraft atmospheres are outlined and analyzed. A list of possible contaminants derived from various materials in the spacecraft is given. Life support systems for supplying oxygen and water are examined. Various methods used in controlling the atmospheric composition are reviewed and a carbon dioxide removal system is shown.

A64-80789

SPACE RADIATION SHIELDING.

A. Donald Goedeke (Douglas Aircraft Co., Inc., Santa Monica, Calif.)

IN: SPACE EXPLORATION.

Edited by Donald P. Le Galley and John W. Mc Kee.

New York, McGraw-Hill Book Company, 1964, p. 324-349. 57 refs.

A survey is presented on the present knowledge of the nature and properties of space radiation. The relation between biological dose restrictions and dosages expected in space are analyzed. The problems of shielding are discussed in the light of vehicle advancements, missions, radiation-warning techniques, and the most recent data on radiation and high-energy nuclear reactions. Active and passive shielding would include the use of electromagnetic and electrostatic fields, although present techniques are not adequate. Passive shielding utilizing aluminum, beryllium, and magnesium to absorb radiation would be effective.

A64-80790

FUTURE SCIENTIFIC EXPERIMENTS IN THE UNMANNED LUNAR AND PLANETARY PROGRAM.

Manfred Eimer (Space Gen. Corporation, El Monte, Calif.)

IN: SPACE EXPLORATION.

Edited by Donald P. Le Galley and John W. Mc Kee.

New York, McGraw-Hill Book Company, 1964, p. 428-439.

Future plans for manned and unmanned space probes should be concerned with answering the important questions concerning stellar evolution, the formation of the planetary system, and the origin of life. The author suggests various methods and means of observation for collecting data on these subjects. In his concern with the origin of life the author discusses the detection of life on Mars. To establish the existence of life on Mars these questions must be answered: (1) how does it live, (2) what does it look like, (3) what does it eat, and (4) what is it made of?

A64-80791

CONTRIBUTION TO THE QUESTION OF FAT EMBOLISM IN FATAL DECOMPRESSION SICKNESS (BEITRAG ZUR FRAGE DER FETTEMBOLIE BEI TODLICHER DRUCKFALLKRANKHEIT).

H. Fischer.

Monatsschrift für Unfallheilkunde Versicherungs- Versorgungs- und Verkehrsmedizin, vol. 66, Aug. 1963, p. 318-322. 28 refs. In German.

A report is given of a case of fat embolism associated with an unexplained fatal aircraft accident. A 23-year-old student pilot was flying at an altitude of 19,000 feet in a T-33 aircraft before the crash. An autopsy examination revealed fat emboli in the lungs and other organs. The aircraft did not burn, and there was no evidence of injury to the pilot prior to the crash. A review of other reports of fat embolism occurring at higher altitudes suggests that the presumed altitude of flight was inaccurate in this case, or that fat embolism is possible at an altitude lower than that previously considered hazardous.

A64-80792

RADIOTELEMETRIC INVESTIGATION OF THE DIGESTIVE TRACT FUNCTIONS (RADIOTELEMETRICHESSKOE IZUCHENIE FUNKTSII PISHCHEVARITEL'NOGO TRAKTA).

A. S. Belousov, I. I. Malkiman, and A. M. Sorin.

Vestnik Akademii Meditsinskikh Nauk SSSR, vol. 19, 1964, p. 71-78. In Russian.

A radiometric method utilizing a minute swallowable radiocapsule for the study of the gastrointestinal processes is described. The detailed capsule structure and principles employed for measuring pH, pressure, and temperature are given. The accuracy of the method checked by standard procedures was found to be comparable. Results showed normal temperature as: (1) gastric 37.2°C to 38.0°C ; (2) distal end of small intestine 38.0°C to 39.0°C ; and (3) large intestine 37.3°C to 37.5°C . Gastric temperature rise of 0.5°C to 1.0°C was observed after food intake. Changes in the fasting gastric pressure indicated periodic activity. The pressure increased in the small intestine with a peak at the ileocecal valve, followed by an abrupt drop to a negative value. In the large intestine the pressure increased gradually. Normal pH values

were recorded as: (1) gastric, 1.0 to 2.0; (2) small intestine, 8.0 to 9.0; and (3) large intestine, 4.0 to 5.0. Possibility for measurement of other parameters, and capsule implantation is suggested.

A64-80793

OXYGENATION OF THE BRAIN TISSUES DURING BREATHING OF AIR AND OXYGEN WITH ADDITION OF CARBON DIOXIDE. (OKSIGENATSIIA TKANEI MOZGA PRI DYKHANII YOZDUKHOM I KISLORODOM S PRIMES'IU CO₂).

E. A. Kovalenko, V. L. Popkov, and I. N. Cherniakov. *Fiziologicheskii Zhurnal SSSR*, vol. 50, Feb. 1964, p. 177-182. 19 refs. In Russian.

Experiments were conducted on dogs with platinum electrodes permanently implanted in the brain tissue. The dynamics of O₂ tension were determined in the brain tissues during inhalation of gas mixtures with various concentrations of O₂ and CO₂. The areas explored were in the cortex and subcortex. The readings included pneumogram, pulmonary ventilation, EMG of the abdominal muscles, EKG, EEG, and blood pressure of the femoral artery. The time of exposure to each mixture was 3 minutes. The authors conclusions were: (1) Air containing 5 to 10% CO₂ causes a 25% increase in tissue oxygen tension of the cortex, and 60% in the subcortical areas. (2) pure O₂ gives a 50-100% increase. (3) Concentrations of 95-90% O₂, together with 5-10% CO₂, results in a 200-300% increase. The authors find this method valuable in the determination of the oxygenation process of brain tissue.

A64-80794

EFFECTIVE DIFFERENCE IN INFLUENCE OF RELATIVE SIZE ON PERCEIVED RELATIVE DISTANCE.

William Epstein (Kansas University, Lawrence). *Perceptual and Motor Skills*, vol. 18, Apr. 1964, p. 383-384. Grant No. USPHS-G-MH-04153-C4.

Variations in relative perceived distance as a function of relative visual angle were studied. Variations in angular ratios which left the absolute size difference constant produced variations in relative distance. Variations in absolute difference without accompanying variations of angular ratios were ineffective.

A64-80795

EYE MOVEMENTS DURING VIGILANCE.

N. H. Mackworth (Harvard Sch. of Pub. Health, Boston, Mass.), I. T. Kaplan (Dunlap and Associates, Inc., Stamford, Conn.), and W. Metlay (U. S. Naval Training Device Center, Port Washington, N.Y.). *Perceptual and Motor Skills*, vol. 18, Apr. 1964, p. 397-402. 8 refs. Grant No. PHS-G-B-2875.

Eye movements were observed in six subjects watching for signals, which were 0.5 second pauses in the motion of a slowly revolving pointer. The following results were obtained: (1) Detection probability for two dials was approximately half the detection rate for one dial. (2) Analysis of eye-movement records showed that in the one-dial situation every missed signal was fixated without being recognized. (3) In the two-dial condition, signals were not only either fixated or unfixed, but some were fixated for part of their duration; approximately one-third of the signals fell into each fixation category. (4) In contrast to the one-dial condition, the largest proportion of unreported signals for two dials were not fixated at all; nearly as many unreported signals were partially fixated; about one-quarter of the unreported signals were fixated for their full duration. (5) Individual subjects differed with respect to the time they paused on one dial before shifting to the other; those who shifted more frequently detected more signals.

A64-80796

INTERLIMB TRANSFER OF CHANGES IN TACTUAL ACUITY FOLLOWING OCCLUSION OF A CIRCUMSCRIBED AREA OF THE SKIN.

Marion Aftanas and John P. Zubek (Manitoba U., Winnipeg, Canada). *Perceptual and Motor Skills*, vol. 18, Apr. 1964, p. 437-442. 9 refs.

Three groups of subjects were used, one serving as control and the others exposed to either a week of no tactual stimulation of a circumscribed area on the left forearm or a week of constant light pressure to the same skin area. Two measures of tactual acuity, namely two-point threshold and tactual fusion, were taken before and after each condition. Both measures indicated an increase in acuity following the "no stimulation" condition and a decrease in acuity after constant stimulation. No effect was shown by the control group. Changes in tactual acuity similar to those produced on the experimental arm, but not as pronounced, were also present on a homologous but not on a nonhomologous area of the contralateral arm. A differential sensory input hypothesis is postulated as an explanation of the results.

A64-80797

RELATION OF CIRCULATION TIME TO AGE, SEX, AND BODY HEIGHT (DIE ABHANGIGKEIT DER KREISLAUFZEIT VON ALTER, GESCHLECHT UND KÖRPERLÄNGE).

W. Börner, E. Moll, J. Schröder, and F. P. Rau (Wurzburg U., Med. Poliklinik, West Germany).

Archiv für Kreislaufforschung, vol. 43, May 1964, p. 221-235. 40 refs. In German.

Circulatory time from left arm to right thigh was measured in 237 healthy euthyroid subjects by use of ¹³²I. The relation of circulatory time to age, sex, and height was evaluated statistically. A linear correlation was found between circulatory time and age for both sexes with intrasex differences between the curves. In women there is no relation between circulation time and height, while in men the circulatory time increases with height. This factor is also responsible for the significantly lower circulatory times in men as compared to women. Reclassification of circulation times for both sexes into classes according to height erases the sex difference. The authors conclude that the observed sex difference is based on the height-circulatory time relation in men and the height differences between men and women.

A64-80798

RESEARCH ON BEHAVIOR IMPAIRMENT DUE TO STRESS: AN EXPERIMENT IN LONG-TERM PERFORMANCE.

David B. Orr (Am. Inst. for Res., Washington, D.C.). *Journal of Experimental Psychology*, vol. 68, Jul. 1964, p. 94-102. 5 refs. Contract No. AF 41(657)-39.

Many simple experiments in sleep deprivation have failed to produce performance decrement. This experiment differed by employing a continuous performance, multitask situation with slowed clocks to reduce goal gradients. Two highly capable Air Force Reserve Officer Training Corps subjects performed continuously in a complex task situation for 21 hours. Performances on the six tasks in the complex peaked within a few hours after beginning the testing period. Thereafter performance decrement increased progressively, with performance on scanning tasks reaching 0 and psychomotor task performance little better. Substantial intertask and intersubject differences were noted. Voluntary food and water deprivation also occurred.

A64-80799

EFFECTS OF VISUAL DEPRIVATION ON IMAGERY EXPERIENCED BY DEAF SUBJECTS.

J. H. Mendelson, F. R. Ervin, P. Solomon (Harvard Med. School, Boston, Mass.), P. E. Kubzansky (Boston, U., Mass.), R. Harrison (Mass. U., Amherst), L. Siger (Gallaudet Coll., Wash., D.C.), P. H. Leiderman (Stanford U. School of Med., Palo Alto, Calif.) et al. IN: RECENT ADVANCES IN BIOLOGICAL PSYCHIATRY, VOL. VI: The Proceedings of the Eighteenth Annual Convention and Scientific Program of the Society of Biological Psychiatry, Atlantic City, N.J., Jun. 7-9, 1963. Edited by Joseph Wurtis.

New York, Plenum Press, 1964, p. 74-87. 14 refs. Contracts No. Nonr 1866(41) and 1866(29).

Twenty adult males with congenital deafness and with early acquired deafness were studied under control conditions and under conditions of visual deprivation. Variables such as sequence of experimental conditions, subjects' expectancy of experimental goals, and imagery experienced in real-life situations were explored. The frequency of visual imagery was greater in the experimental than in the control conditions, and in the first experimental session than in the second session. The quality of imagery experienced was not related to the age of onset of auditory deficit, or to the type of experimental condition. It also was found not to be significantly correlated with the subject's usual daydreams, night dreams, or what he expected would occur in the experiment.

A64-80800

EFFECTS OF DIPHENYLHYDANTOIN ON THE DURATION OF RESPIRATORY ACTIVITY DURING HYPOXIA.

June G. Naiman and Harry L. Williams (Emory U., Dept. of Pharmacol., Atlanta, Ga.). *Journal of Pharmacology*, vol. 145, Jul. 1964, p. 34-41. 20 refs. Grants No. PHS-G-NE-03544; and PHS-G-9270.

Diphenylhydantoin prolonged the duration of respiratory activity in cats and guinea pigs subjected to nitrogen anoxia as well as in the decapitated guinea-pig head. Trimecathione lacked this effect. This effect of diphenylhydantoin was not due to an action on carotid or aortic chemoreceptors, nor was it related to drug-induced hypothermia or diminished convulsive activity. Midcollicular decerebration greatly increased the respiratory survival time of cats during anoxia, and diphenylhydantoin caused no further increase in these preparations. Electroencephalographic studies revealed no qualitative difference between control and diphenylhydantoin-treated animals during anoxia. Treatment with reserpine did not decrease the effectiveness of diphenylhydantoin in prolonging survival time. However, a dose of 75 mg/kg. iodoacetate prevented the increase in survival time with diphenylhydantoin without affecting control survival values. A decrease in the frequency of respiration during anoxia as compared with control frequencies was found to accompany the prolongation of survival time with diphenylhydantoin in the guinea pig. It is suggested that the action of diphenylhydantoin in prolonging respiratory survival time during anoxia may be due in part to a direct effect on the respiratory neurons of the central nervous system.

A64-80801

PHYSIOLOGICAL RESPONSES ASSOCIATED WITH TIME ESTIMATION IN A HUMAN OPERANT SITUATION.

D. G. Doehring, J. E. Helmer, and Elizabeth A. Fuller (Ind. U. Med. Center, Indianapolis).

Psychological Record, vol. 14, Jul. 1964, p. 355-362. 5 refs.

Galvanic skin response (GSR), heart rate, forearm muscle potential, and volume pulse of the finger were recorded for five human subjects during six sessions in which positive reinforcement was obtained by maintenance of an interval of slightly more than one minute between lever presses (differential reinforcement of low rate, with limited hold). Systematic changes of physiological activity occurred in association with the lever-pressing response, whether reinforced or nonreinforced. These changes were most pronounced for the GSR, where two different patterns of activity were exhibited by the subjects, and for forearm muscle potential, where all subjects showed their largest increment of tension following the lever press. The consistent GSR to reinforcement, which had been observed in previous studies involving variable-interval and fixed ratio reinforcement, did not occur in the present study. Among the five subjects, one showed significant increments of both GSR and heart rate to reinforcement, a second showed a significant increment of heart rate, and a third showed a significant increment of the volume pulse response.

A64-80802

THE ROLE OF THE ELECTRORETINOGRAM IN FLIGHT PERSONNEL EVALUATION [L'INTERET DE L'ELECTRORETINOGRAMME DANS L'EXPERTISE DU PERSONNEL NAVIGANT].

J. Robion, G. Perdriel, P. Desbordes, and M. Leblanc (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéron., Paris, France). *Revue de Médecine Aéronautique*, vol. 3, Jan.-Feb. 1964, p. 599-601. In French.

The electroretinogram represents a useful and effective adjunct to the routine type ophthalmological examination used in the selection of flight personnel. A study of 67 cases revealed that electroretinography helped to clarify cases in which the ophthalmological findings were doubtful. The latter should, however, always take first place in visual testing of aviators.

A64-80803

OXYGEN AND THE ELECTRORETINOGRAM [OXYGENE ET ELECTRORETINOGRAMME].

G. Perdriel, G. Soussen, P. Desbordes, and M. Leblanc (Centre Principal d'Expertise Médicale du Personnel Navigant de l'Aéronautique, Paris, France). *Revue de Médecine Aéronautique*, vol. 3, Jan.-Feb. 1964, p. 603-607. 12 refs. In French.

Electroretinograms of 16 persons have been made during simulated flight conditions of anoxia, hyperoxia, and explosive decompression. Moderate anoxia of 11.5% oxygen for 10 minutes had little effect on the retina. Acute anoxia, as in decompression sickness, caused no effect during inhalation of the 5% oxygen for an average time of 4 minutes 40 seconds, but an exaggerated "a" wave and a slight deviation in the "b" wave were noted 30 seconds after being returned to 100% oxygen. Hyperoxia, of 100% oxygen for 50 minutes, caused an increased bioelectric activity in light-adapted retinas when exposed to white light, but a decrease when exposed to red light. In dark-adapted retinas, hyperoxia caused a decrease in bioelectric potential of the retina, which is normally compensated by increased function of the visual cortex.

A64-80804

RECENT NEPHROLOGICAL AND AEROMEDICAL PROGRESS [ACQUISITIONS RECENTES EN NEPHROLOGIE ET MEDECINE AERONAUTIQUE].

Paul Milliez. *Revue de Médecine Aéronautique*, vol. 3, Jan.-Feb. 1964, p. 625-628. In French.

The only kidney diseases which contraindicate pilot training are permanent proteinuria, lithiasis, and especially permanent arterial hypertension. Other sicknesses, such as glomerulonephritis and renal tuberculosis, should be treated according to the degree of sickness of the individual.

A64-80805

ON PHOTOSYNTHESIS OF SYNCHRONOUSLY CULTIVATED *CHLORELLA PYRENOIDOSA* [ZUR PHOTOSYNTHESE SYNCHRON KULTIVIERTER *CHLORELLA PYRENOIDOSA*].

Günter Döhler (Frankfurt am Main U., Botanisches Inst., Frankfurt am Main, Germany).

Planta, vol. 60, 1963, p. 158-165. 13 refs. In German.

A study was made of the relationship between photosynthesis (carbon dioxide consumption) and fluorescence in synchronized cultures of *Chlorella pyrenoidosa*. Measurements of photosynthesis in relation to sediment thickness in cells obtained by filtration revealed a linear relation for autospores, while photosynthesis in young cells showed a sharp increase up to a thickness of 25 mg. dry weight/decimeter², thereafter remaining stationary for 8 to 10 days. Autospores exposed to a 16 to 8 hour light to dark rhythm showed an increase in photosynthesis to a maximum at 2 hours, followed by

a gradual decline to a minimum at 18 hours. Photosynthesis was greatest in young cells, with the maximum rate during the light phase 6 times greater than the minimum during the dark phase. Changes in photosynthetic rate were inversely correlated with fluorescence. Autospores showed a relatively high fluorescence, with little difference between induction and stationary fluorescence values. Fluorescence in young cells was relatively low, and the difference between induction and stationary values was correspondingly greater.

A64-80806

ON THE EFFECT OF GRADUALLY INCREASED CONCENTRATIONS OF DIFFERENT PLASMOLYTIC AGENTS ON THE FLUORESCENCE OF THE CHLOROPLASTS IN SYNCHRONOUSLY CULTIVATED *CHLORELLA PYRENOIDOSA* [UBER DEN EINFLUSS ABGESTUFTER KONZENTRATIONEN VERSCHIEDENER PLASMOLYTICA AUF DIE CHLOROPLASTEN-FLUORESCENZ SYNCHRON KULTIVIERTER *CHLORELLA PYRENOIDOSA*].

Günter Döhler and August Ried (Frankfurt am Main U., Botanisches Inst., Frankfurt am Main, Germany).

Archiv für Mikrobiologie, vol. 46, 1963, p. 190-216. 32 refs. In German.

Experiments were conducted to determine the effect of osmotic factors on the fluorescence of synchronized cultures of *Chlorella pyrenoidosa*. Fluorescence intensity for all cell stages increased with increases in the thickness of the cell suspension to a maximum at 0.3 to 0.5 mg. dry weight/ml. Autospores exposed to light showed a sharp decrease in fluorescence, followed by an increase after 2 hours to a maximum at 10 hours. The stationary fluorescence of autospores suspended in solutions of saccharose, lutrol, and calcium chloride decreased sharply with increasing concentrations up to 1.1 to 1.2 moles. Fluorescence remained stationary with higher concentrations of lutrol and saccharose, but increased with concentrations of CaCl₂ above 1.1 moles. Young cells were only slightly affected by changes in concentration up to 2 moles, while 14 to 22 hour cells reacted similarly to autospores. It is suggested that the effect of osmotic changes on fluorescence at various stages of cell development reflects changes in photosynthesis.

A64-80807

THE ORIGIN OF LIFE AS THE PROBLEM OF THE FORMATION OF MACROMOLECULES [L'ORIGINE DELLA VITA COME PROBLEMA DELLA FORMAZIONE DI MACROMOLECOLE].

F. Cedrangolo (Napoli U., Ist. di Chim. Biol., Naples, Italy).

Scientia, vol. 99, Feb.-Mar. 1964, p. 42-48. In Italian.

The problem of origin of life on earth is approached from the theory that protein and nucleic macromolecules have evolved chemically. Two possibilities are taken into consideration: (1) that proteins and nucleic acid formed at the same time; and (2) that first the proteins, then the nucleic acids originated, the latter as a result of enzymatic action on the former. Biosynthetic mechanisms are also considered as a possibility and briefly discussed. The possibility of life on other planets is hinted at. In conclusion, it is emphasized that the problem of origin of life is within the realm of biochemistry today and methods of pursuit of these investigations are indicated.

A64-80808

ON THE EFFECT OF DIFFERENT PLASMOLYTIC AGENTS ON PHOTOSYNTHESIS AND FLUORESCENCE OF CHLOROPLASTS OF *CHLORELLA VULGARIS* [UBER DEN EINFLUSS VERSCHIEDENER PLASMOLYTICA AUF PHOTOSYNTHESE UND CHLOROPLASTEN-FLUORESCENZ VON *CHLORELLA VULGARIS*].

Günter Döhler (Frankfurt am Main U., Botanisches Inst., Frankfurt am Main, Germany).

Beiträge zur Biologie der Pflanzen, vol. 39, 1963, p. 147-151. 7 refs. In German.

A study was made of the effect of various concentrations of plasmolytics on photosynthesis and fluorescence in cultures of *Chlorella vulgaris*. Carbon dioxide consumption and fluorescence were measured in cells obtained by filtration after 1 hour in a calcium chloride or saccharose solution. Carbon dioxide consumption decreased with increasing concentrations of plasmolytics, reaching zero (complete re-assimilation of carbonic acid) with 2 molar saccharose and 1 molar CaCl₂. Changes in photosynthesis were paralleled by changes in fluorescence. The fluorescence induction value was greater than stationary fluorescence at low plasmolytic concentrations, but decreased to the stationary value at minimum photosynthesis. The dependence of fluorescence and photosynthesis on the water content of cells suggests that the osmotic condition influences photosynthesis in both the light and dark phases of the growth cycle.

A64-80809

EFFECTS OF TEMPERATURE ON *CHLORELLA PYRENOIDOSA* WITH SPECIAL CONSIDERATION OF CELLULAR DEVELOPMENT [TEMPERATUREINFLUSSE AUF *CHLORELLA PYRENOIDOSA* UNTER BESONDERER BERÜCKSICHTIGUNG DER ZELLENENTWICKLUNG].

Harald Lorenzen (Göttingen U., Pflanzenphysiol. Inst., Germany).

Flora, vol. 153, 1963, p. 554-592. 60 refs. In German.

A study was made of the effect of temperature on the growth and chlorophyll content of synchronized cultures of *Chlorella pyrenoidosa*. Exposure of

30° C. cultures to a temperature of 12.5° C. immediately before mitosis resulted in prolongation of mitosis and death of the daughter cells. Autospores exposed to cold grew slowly, dividing only after 10 days. The cultures became yellow-green in the cold, but returned to normal color within several hours after exposure to 30° C. Cooling of cells for 2 to 3 hours to 4° C. resulted in a sharp decrease in chlorophyll content. Cells cooled 7 to 9 hours after the beginning of the growth period were more affected than cells cooled in the first hours or after 13 to 16 hours. Bleaching was reduced by decreases in light intensity and by exposure to nitrogen during cooling. Cooling in the first hours of the dark phase delayed mitosis only slightly, and had no effect on autospores. Exposure to a temperature of 46° C. for 15 minutes inhibited chlorophyll synthesis in autospores and 5-hour cells, but had little effect on 10- to 16-hour cells. Bleaching was greater when cells were heated during the dark phase, and was not inhibited by exposure to nitrogen. An optimum temperature of 33° C. was found for cell growth in cultures exposed to alternating periods of light and darkness.

A64-80810

NOISE AND WEBER'S LAW: THE DISCRIMINATION OF BRIGHTNESS AND OTHER DIMENSIONS.

Michel Treisman (Inst. of Expt. Psychol., Oxford, England).

Psychological Review, vol. 71, Jul. 1964, p. 314-330. 55 refs.

The model of the threshold given by signal detection theory is used as a basis for explaining the form of the Weber function. For this purpose three sources of noise are considered: spontaneous background noise, the irreducible physical variability of the stimulus, and variation in the response of the neural pathways simultaneously excited by the administration of a stimulus. It is postulated that the last shows positive correlation, i.e., that the central effects of the different elements which are simultaneously activated by a stimulus will vary from trial to trial in a similar, rather than in an independent fashion. If this is accepted, a law for the Weber function can be derived which gives, for visual brightness discrimination, a square root relation at low stimulus intensities with a continuous transition to a linear law at high intensities, and which can be applied to explain some features of visual spatial and temporal summation. The model also allows Weber's law to be derived for other sensory dimensions.

A64-80811

HEART RATE RESPONSE TO AUDITORY STIMULI OF VARYING DURATION.

Roger W. Black (Iowa State U., Ames).

Psychonomic Science, vol. 1, Jul. 1964, p. 171-172.

Grant No. NIH-G-M-6132.

Rats were presented a 40 db, white noise with a duration of from 1.0 to 10.5 seconds. The stimulus initially produced heart rate deceleration, while the magnitude of the response increased with stimulus duration. With subsequent presentations, the heart rate response was an increasing function of stimulus duration, with 82% of the maximum responses following stimulus offset. These phenomena complicate the investigation of classical conditioning of heart rate.

A64-80812

RESPONSE UNCERTAINTY AS A DETERMINANT OF REACTION TIME.

I. M. Schlesinger (Hebrew U., Jerusalem, Israel).

Acta Psychologica, vol. 22, 1964, p. 52-59. 11 refs.

The hypothesis that reaction time (RT) is a function of response uncertainty and not only information transmitted was put to test. For each of 16 subjects simple RT and disjunctive RT were measured under the following two conditions; (a) one response was to be made to each stimulus, as in the usual RT experiment; and (b) for each stimulus two responses were appropriate, and the subject was instructed to employ either one; both responses had identical results and thus the choice could have been a matter of indifference to the subject. It was found that the latter condition resulted in significantly higher RTs in the case of disjunctive RT, but only in an insignificant increase in the case of simple RT. The implications of these findings, as well as of those suggesting that stimulus uncertainty may increase RT, were discussed, and a more complicated model of the organism in RT situations was outlined.

A64-80813

MYOCARDIAL DEVELOPED TENSION AND OXYGEN SUPPLY.

Eugene A. Lentini (Ore. U., Med. School, Dept. of Physiol., Portland).

American Journal of Physiology, vol. 207, Aug. 1964, p. 341-346. 16 refs.

Grant No. PHS-G-HE-0462; Oregon Heart Assoc., and Med. Res. Journal.

The isometric developed tension of rat's trabecula carnea was recorded, *in vitro*. The magnitude of the developed tension was observed to be directly a function of the partial pressure of oxygen in the aerating mixture. This activity reached a maximum at pO_2 values of 700 mm. Hg. Fluctuations in the developed tension were noted during the first hour of the experiment; insignificant changes with noted exceptions occurred during the second and third hour. The data indicate that the mechanical response of the tissue is a function of both duration of the experiment and aerating gas mixture. The diffusion coefficient (D') of oxygen through the preparation was calculated.

The results indicate that the D' value for heart muscle may be larger than that of skeletal muscle as determined by Krogh.

A64-80814

PROLONGED ANOXIC SURVIVAL DUE TO ANOXIA PRE-EXPOSURE:

BRAIN ATP, LACTATE, AND PYRUVATE.

Nancy Ann Dahl and William M. Balfour (Kansas U., Dept. of Comp. Biochem. and Physiol., Lawrence).

American Journal of Physiology, vol. 207, Aug. 1964, p. 452-456. 25 refs. Grants No. NSG-298-62; and NIH-G-B-1151.

Rats subjected to a brief anoxia can survive 90 seconds in a second anoxia, compared to a 60 second survival time of control animals. Slower disappearance of ATP concentration in the brain during the second exposure indicates this longer survival is due to an altered cerebral energy metabolism. Initial cerebral ATP concentration is no higher in pre-exposed animals than in controls. When glycolysis is inhibited by iodoacetate before testing in anoxia, the advantage of preexposure disappears, suggesting the longer survival may be due to increased anaerobic glycolysis. Lactate accumulates faster during anoxia in the brains of preexposed animals than in controls, suggesting that increased anaerobic glycolysis is the cause of the prolonged survival. This effect is not due to increased cerebral glucose concentration. A possible reason for this increased glycolysis, and thus the prolonged survival, could be an increase of a compound, such as pyruvate, capable of oxidizing the reduced form of nicotinamide-adenine dinucleotide (NADH). The initial pyruvate is higher in preexposed animals than in controls and injection of pyruvate increases the survival time slightly.

A64-80815

CARBOHYDRATE METABOLISM OF MICE EXPOSED TO SIMULATED CHANGES IN GRAVITY.

Jiro Oyama and William T. Platt (Nat. Aeron. and Space Admin., Ames Res. Center, Environ. Biol. Div., Moffett Field, Calif.).

American Journal of Physiology, vol. 206, Aug. 1964, p. 411-414. 22 refs.

Unrestrained mice were centrifuged for varying periods ranging from 0.5 to 10 hours at 2.5, 5, and 10 g. Liver glycogen and blood glucose levels increased significantly depending on the g load and exposure time. Adrenalectomy completely abolished the glycogen deposition response. The glycogen response was a critical function of the age of mice; unweaned mice did not respond. Blood corticosterone increased significantly prior to the deposition of glycogen. Centrifuged fed mice deposited three times the amount of glycogen of fasted mice. There was no significant difference in the amount of glycogen deposited in centrifuged mice previously starved for 1, 2, or 3 days. It is concluded that the increased glycogen deposited following centrifugation is effected by an increased elaboration of adrenal corticosterone.

A64-80816

SOME HUMAN FACTORS CONSIDERATIONS FOR AN ORBITAL MAINTENANCE AND MATERIALS TRANSFER SHUTTLE.

Carl R. Adams (Douglas Aircraft Co., Inc., Advan. Space Technol., Biotechnol. Branch, Santa Monica, Calif.) and George Hanff (Lockheed Aircraft Corp., Calif. Div., Burbank, Calif.).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 1-3.

This paper contains a review of probable human space-maintenance missions and a brief summary of certain inherent human restraints that are likely to influence effective accomplishment of such missions in space. Also included in this paper is a brief documentation of an investigation conducted by the authors, during which a range of realistic tasks were performed by a subject in a full pressure suit under simulated space-maintenance conditions. Throughout the investigation, an anecdotal record was maintained by the experimenters, the spontaneous observations of the subject were recorded on tape, and the experiments were recorded on film. As a result of the investigation and experimentation, tentative conclusions were drawn concerning appropriate modification of standard tools, design of a one-man shuttle vehicle, and space-maintenance techniques.

A64-80817

BLOOD OXYGEN CHANGES INDUCED BY FORWARD (+G_x) ACCELERATION.

Natalio Banchoer (NIH, Washington, D.C.), Lucille Cronin, A. Clark Nolan, and Earl H. Wood.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 4-6.

Contract No. AF33(657)-8899, NASA R-43; and NIH Grant No. H-3532.

Anesthetized dogs were exposed to forward acceleration of 2, 4 and 6 g for one-minute periods, breathing room air in horizontal 15° head-down positions. Horizontal exposures to 6 g were repeated for three-minute periods on dogs breathing room air or 99.6% oxygen. Femoral artery oxygen desaturation progressed with the increase of the acceleration stress, with fast recovery after exposure. Administration of 99.6% oxygen during 6 g delayed but did not prevent desaturation. Mixed venous blood showed desaturation with delayed recovery. The respiration amplitude and rate increase were noted

without a consistent pattern. The estimated pulmonary arterial venous shunts increased with the level of acceleration. Arterial and mixed venous blood indicated homoconcentration. Necropsy showed atelectasis in the dorsal portion of lungs and emphysematous alveoli in the ventral areas.

A64-80818

THE ROLE OF PSYCHOLOGICALLY INDUCED PASSIVE HYPERVENTILATION IN AEROSPACE SAFETY.

Manuel Copes (Douglas Aircraft Co., Inc., Missiles and Space Systems Div., Santa Monica, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 7-9.

A large number of aircraft accidents and incidents in which such causes as hypoxia, oxygen toxicity, and pilot error have been suggested, may have actually been the result of hyperventilation. Hyperventilation can be precipitated by such psychological factors as anxiety, apprehension, fear, and emotional instability. The following preventive approaches are suggested: (1) education of aerospace vehicle operators of exactly what hyperventilation is and the changes it produces in the blood; (2) instruction to air traffic control operators providing a better understanding of the dangers of compounding hyperventilation and its complications upon an already existing emergency situation; (3) immediate and thorough examination of aerospace accidents to determine whether or not hyperventilation has been a causative factor; and (4) development of a continual monitoring device to alert the pilot when he is hyperventilating during flight.

A64-80819

THE INFLUENCE OF THE AFTER-EFFECTS OF ALCOHOL COMBINED WITH HYPOXIA ON PSYCHOMOTOR PERFORMANCE.

James R. Carroll, William F. Ashe, and Lester B. Roberts (Ohio State U., Dept. of Preventive Med., Columbus).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 13.

The delayed effect of ethanol on human subjects while performing a psychomotor task in a decompression chamber was tested on six male subjects, of which three were pilots. The subjects performed the task for 15 minutes at simulated altitudes of 8,000 and 13,000 feet ten hours after drinking the ethanol. An analysis of variance and the Duncan Multiple Range Test were used to analyze the results. Both statistical methods confirmed an absence of effects due to alcohol and altitude. Subjective symptoms, such as headache and increased fatigue, are noted.

A64-80820

CIRCULATORY AND METABOLIC EFFECTS OF PROLONGED INACTIVITY.

N. C. Burkhead, B. Isaacowitz, Jr., J. J. Blizzard, George J. Haupt, R. N. Myers, P. A. La Chance, and K. Rodahl (Lankenau Hosp., Div. of Res., Philadelphia, Pa.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 14-15.

Contract Nos. AF33(657)-9049 and AF33(657)-9049 SA2.

Circulatory and metabolic responses to three types of inactivity were studied in groups of four healthy men. The types of inactivity studied were: (1) continuous supine bed rest for 43 days (4 subjects); (2) twenty-four days of supine bed rest except for one hour daily supine (two subjects) or sitting (two subjects) bicycle ergometer exercise; and (3) thirty days of daily sitting (eight hours) and lying (sixteen hours) inactivity (four subjects). Each period of inactivity was preceded by an eighteen-day control period during which subjects exercised one hour each day on a bicycle ergometer for training. A similar eighteen-day period of retraining followed each of the periods of inactivity. Tilt tolerance, physical work capacity, maximum oxygen uptake, nitrogen balance, and urinary calcium excretion were affected by each of the above conditions.

A64-80821

AN INSTRUMENT FOR THE TOTALIZATION OF HEARTBEATS AND RESULTS OF ITS APPLICATION.

A. E. Brown (Lockheed Missiles and Space Co., Res. Labs., Palo Alto, Calif.), M. Friedman, and R. H. Rosenman (Harold Brunn Inst., Mt. Zion Hosp., San Francisco, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 16-19. 5 refs.

Lockheed Independent Res. Program-supported research.

Design consideration for a heartbeat totalizer are presented including modification of electrocardiographic amplifier frequency response to facilitate heartbeat detection by the QRS complex. The heartbeat totalizer was used in a research program concerned with the number of heartbeats occurring 24 hours in three groups of subjects. It was found that a group of subjects selected on the basis of a strong sense of time urgency (type A) would show a 400% to 700% greater incidence of clinical coronary artery disease than

people exhibiting the converse pattern (type B). There were 10 type A and 11 type B participants in the program. The third comparative group was comprised of 21 subjects suffering from functional cardiovascular disease and coronary heart disease. It was found that the average daily heart rate appeared to be about the same for all categories of subjects except those who had suffered from a previous infarction and were experiencing symptoms. This latter group had a faster heart rate. Heartbeat totals ranging from 110,000 to 125,000 for a 24-hour period were generally observed.

A64-80822

THE NORMAL FECAL FLORA OF MAN AND ITS ALTERATIONS UNDER SIMULATED SPACE FLIGHT.

L. S. Gall, P. E. Riely, and R. R. Cardenas, Jr. (Republic Aviation Corp., Space Environment and Life Sci. Lab., Farmingdale, L. I., N.Y.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 20-22.

Atmospheric pressure and composition, radiation, diet, and stress may alter the intestinal flora during spaceflight. Previous bioecological studies indicated that diet, radiation, and varying concentrations of atmospheric oxygen modify types of fecal microorganisms. Under conditions of monotonous diet, simplification of fecal flora was noted. There was also more similarity of bacterial types in all individuals at the end of the period than at the beginning of the study, suggesting transfer of flora. Studies are in progress to determine more precisely the number and types of normal intestinal microorganisms. The findings will form a baseline for determining changes under abnormal conditions.

A64-80823

STRESS FACTORS AND WEAPONS ACCURACY DELIVERY IN HIGH-PERFORMANCE AIRCRAFT.

John C. Duffy (Mayo Clinic and Found., Rochester, Minn.) and Henry B. Hale (USAF School of Aerospace Med., Brooks AFB, Tex.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 23-26.

Postflight urinary determinations were employed for the purpose of evaluating flying stress in 10 pilots of F-100 aircraft who performed low altitude bombing missions both in daytime and at night. Control data were obtained on nonflying days. Rough appraisal of protein and mineral metabolism and of sympathoadrenal and adrenocortical activity was thus accomplished. Flying effects on the sympathoadrenal system were distinct, as were those on sodium excretion. It appears that the pilots who performed less capably tended to hyperventilate, since they excreted unusually high amounts of sodium and catecholamines. The results give good leads for further research on the physiologic reactions of pilots flying high-performance aircraft.

A64-80824

RADIOBIOLOGICAL EFFECTS OF INCOMPLETELY PENETRATING ELECTRON RADIATION.

O. M. Meredith, E. G. Bowers, and J. T. Heintzelman (Lockheed Missiles and Space Co., Res. Labs., Palo Alto, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 27-29.

Radiobiological effects of uniform exposure of the body of mice to 1 Mev electrons were investigated. The findings strongly implicate the abdominal viscera as the critical response region in spite of the limited penetration of the electron beam. This impression is supported by (a) a more sensitive response if the entire abdomen is irradiated instead of either half; (b) the marked reduction in intestinal and whole body weights seen only with ventral exposure; and (c) the considerably lower threshold for an acutely lethal effect with a ventral exposure as compared with the dorsal aspect. Since the electron beam is known to have limited penetrability, it is attractive to assume that the blood-forming organs are not affected, but this is not true. Thus, it would appear that, at the minimally effective dose level, a lethal effect occurs in similar fashion to 250 kVp X-rays, a delayed death 7 to 14 days post-radiation with a picture of mixed intestinal injury and bone marrow depression. The possibility of radiation protection through partial body shielding and use of chemicals (AET or serotonin) is discussed.

A64-80825

SUBCELLULAR MECHANISMS AND BIOPHYSICAL INDICATORS OF RADIATION-INDUCED INJURY.

Philip B. Hollander (Radio Corp. of Am., Astro-Electron, Div., Princeton, N.J.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 30-32.

Man's capability to tolerate a given dose of ionizing radiation without initiating a pathological effect depends upon the biological system's ability to repair the sustained injury. Ionizing radiation effect can be directly on a well defined submicroscopic structure, or through formation of highly reactive substances within the cellular environment, which may subsequently react with other cellular components. Among the early subcellular changes

is the alteration of the nuclear structure and subsequent interference with normal mitosis. In rats, cellular radiosensitivity varied between cell types of the same histological group. There is an indication of a presence of some unknown activity at some yet unidentified molecular site which could explain these differences in the radiation effect. The biochemical lesions may cause an alteration of the biophysical molecular state of the biological system.

A64-80826

MOVEMENT OF RESPIRED GAS IN MANNED SPACE ENCLOSURES.

D. A. Keating, K. Weiswurm, and G. W. Filson (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio). Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 33.

Lack of convection in a space cabin with a sleeping or restrained astronaut presents certain problems. The limited movement and dispersion of air produced only by the pilot's respiration may result in formation of pockets deficient in oxygen and abundant in carbon dioxide enveloping the subject and may cause gradual suffocation. Mathematical analysis and human models may be employed in solution of the problem. Experiments with smoke exhaled by man may indicate angles of dispersions and exhalation flow patterns.

A64-80827

AIRBORNE TRANSMISSION OF INFECTION IN LOW GRAVITATIONAL FIELDS.

Robert G. Loudon (Tex. U., Southwestern Med. School and Woodlawn Hosp., Dallas).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 34-35.

Airborne particles containing microorganisms will be a form of the atmospheric contamination in prolonged spaceflight projects. Although highly pathogenic organisms would not be expected under spaceflight conditions, the common saprophytes may initiate infections in a closed ecological system. Skin, hair, clothing, food, and respiratory tract, through the atomization of saliva and droplets from the lower part of the respiratory tract, may be sources. Reduction of gravity will prolong the aerial suspension of droplets and droplet nuclei. In a low gravitational field, physical decay of fallout particles will become negligible, and the removal of particles from the atmospheric suspensions will depend on impact, filtration, or thermal and electrostatic precipitation. A new technique for the recognition and measurements of droplets based on their chloride content is described.

A64-80828

UTILIZATION OF URINARY NITROGEN COMPOUNDS BY CHLORELLA PYRENOIDOSA.

V. H. Lynch, E. C. B. Ammann, and R. M. Godding (Lockheed Missiles and Space Co., Res. Labs., Palo Alto, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 36-39.

Human urine is a good source of nitrogen necessary for growth of chlorella pyrenoidosa as was demonstrated by the experiments described. Urea, the major nitrogen compound of urine, was proved to be a better nitrogen source than ammonium ion of nitrate in a long-term, high-density growth system. Uric acid, when used as a sole nitrogen source, promotes growth faster than urea. Guanidine, adenine, xanthine, and hypoxanthine are also utilized, although the intermediate, allantoin, is not used. Arginine, ornithine, citrulline, glycine, alanine, serine, and aspartic acid are used. The amino acids essential for man remain in the residue and may be recovered for human use. Both nitrogen atoms of asparagine and glutamine enter into the metabolic cycle. Glutamic acid, creatinine, or hippuric acid are not used. In all, 90% to 95% of available urinary nitrogen is utilized.

A64-80829

THE CORONARY FLOW RESPONSE TO HYPOCAPNIA INDUCED BY HYPERVENTILATION.

Wm. J. McArthur.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 40-41.

Hypocapnia appeared to be the primary agent controlling coronary flow in anaesthetized dogs respiring under forced ventilation. Although other blood chemical concentrations are undoubtedly altered in hypocapnia, the observations indicate that the response was primarily due to changes in blood CO₂ tension.

A64-80830

THE HEMATOLOGIC EFFECTS OF MICROWAVE EXPOSURE.

S. M. Michaelson, R. A. E. Thomson, M. Y. El Tamami, H. S. Seth, and J. W. Howland (Rochester U., School of Med. and Dentistry, Rochester, N.Y.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 42-44.

Whole-body exposure of normal dogs to microwaves resulted in various changes in leukocyte count, hematocrit values, hemoglobin concentration, red cell volume, plasma iron level, and total plasma iron binding capacity. It also caused appearance of nucleated red cells and reticulocytes in the peripheral blood. The findings indicate hypothalamic and/or adrenal stimulation by microwave exposure. Alterations in ferrokinetics, which are related to duration and intensity of exposure, suggest bone marrow involvement.

A64-80831

SOME NOTES ON THE USE OF SUPEROXIDES IN NON-REGENERATIVE AIR REVITALIZATION SYSTEMS.

A. W. Petrocelli and A. Caporosso, Jr. (Gen. Dyn. Elec. Boat, Groton, Conn.) Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 45-47.

The attractiveness of using superoxides in nonregenerative air revitalization systems is based on their capability of providing breathing oxygen and of eliminating carbon dioxide from the atmosphere. The most dramatic demonstration that a properly engineered system, based on an active chemical, can be successfully employed in life support systems has been given in the Russian Vostok 1 and 2 flights. Although the Russian literature does not indicate that a superoxide is the source of breathing oxygen employed for Vostok vehicles, careful analysis of the published works points to the use of unfamiliar oxidation state compounds of the alkali or alkaline metal superoxide, peroxide, or alkali metal ozonide type. Investigators in this country demonstrated that 0.33 lb./hour/man of potassium superoxide can, by itself, supply metabolic oxygen and remove carbon dioxide, water vapor, gaseous contaminants, and odors from a sealed environment, without overproduction of oxygen. Other studies suggest the possibility that an air regenerative system requiring little electric power, light in weight, small in volume, and requiring no moving parts can be engineered with superoxides.

A64-80832

TARGET VELOCITY, EXPOSURE TIME AND ANTICIPATORY TRACKING TIME AS DETERMINANTS OF DYNAMIC VISUAL ACUITY (DVA).

Edwin H. Elkin (Dunlap and Assoc., Inc., Washington, D.C.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 51-53.

ONR Contract.

Studies of the effects of increasing target velocity, and decreasing exposure time, and anticipatory tracking time on dynamic visual acuity are presented. Results of these studies are outlined. The following conclusions were reached: (1) Visual acuity deteriorates as target velocity increases; deterioration is substantial when measured under relatively restricted acuity test conditions, but becomes less marked as test conditions become less restricted. (2) Measures of static and dynamic acuity correlate positively and significantly under favorable target tracking conditions, good static acuity being a necessary but insufficient condition for dynamic visual acuity.

A64-80833

MODULATED ALTERNATING CURRENT ENERGY USED TO STIMULATE AUDITION IN TOTALLY DEAF HUMANS.

Henry K. Puharich and Joseph L. Lawrence (Intelec Corp., New York, N.Y.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 55-57.

Modulated alternating carrier electrical signals of pure tone frequency applied to the various skin surfaces of the human body caused acoustical tissue vibrations more or less linear to the signals. These findings indicate that the applied electrical field undergoes electromechanical transduction, possibly an electrostrictive effect. The electrical signals applied in the skin region surrounding the normal subject's ear produced stimulation by sound waves originated in the skin electrostrictive site. Other clinical data on patients with impaired hearing indicate that concurrent electric signals also stimulate cochlear microphones. Therefore, in the abnormal cases, cochlear hearing may be stimulated by a combination of acoustic and electric effects. However, these two effects cannot satisfactorily explain the word recognition response in patients with nonfunctional cochlea. In totally deaf, optimal word recognition after electrical stimulus is located in the area of stylomastoid foramen. Further study is necessary to permit evaluation of this peculiar area sensitivity.

A64-80834

LEARNING SET PERFORMANCE OF SQUIRREL MONKEYS AFTER RAPID DECOMPRESSION TO VACUUM.

Duane M. Rumbaugh (San Diego State Coll., San Diego, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 58-61. 5 refs.

Learning Set (LS) proficiency as affected by short- and long-term decompression to near vacuum was investigated in squirrel monkeys. Results clearly indicated no significant loss in LS in any group studied, suggesting

that no brain damage occurred. The diminution of LS which did occur was reversed by the end of six days following decompression. Body weight was found to decrease with severity of decompression exposures. The loss of life for two subjects points up clearly and convincingly the fact that decompression to vacuum entails a risk to life even though the decompression be only for a few seconds. It is impossible to extrapolate with confidence from the squirrel monkey in decompression to man; however, the obvious impairment of normal vision, hearing, locomotion, and eating in the 60-sec. and 90-sec. subjects leads to concern about the ability of an astronaut to perform anything other than the simplest tasks within the first few days, should he be exposed to other than the very shortest of decompression intervals.

A64-80835

CRYOGENIC SYSTEMS FOR USE IN WEIGHTLESS ENVIRONMENTS.

William J. Evon (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 66-68.

Random orientation of liquid must be overcome in order to assure a constant supply of breathing oxygen from cryogenic storage to an astronaut during weightless flight. Two types of converters are suggested: (1) A capillary action type, and (2) a dielectrophoretic device. The capillary action type is based on a principle of liquid rise in a narrow tube constructed of material which is wetted by the liquid. When the adhesive force between the liquid and the tube walls is greater than the cohesive forces between liquid molecules, the liquid is forced out. The electrophoretic converter is based on the ability of a dielectric substance, such as oxygen, to form dipoles induced by high voltage. In a nonuniform field the end of a dipole in the region of the stronger field experiences a greater force than at the opposite end. Therefore, a net force on the dipole causes migration of molecules in the direction of increased field intensity.

A64-80836

NEUROLOGICAL ABNORMALITIES IN A POPULATION REQUIRING AVIATION MEDICAL CERTIFICATION.

John H. Seipel (Georgetown Clin. Res. Inst., Lab. of Neurol., Washington, D.C.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 68.

The Georgetown Clinical Research Institute is conducting a longitudinal study in aging, using volunteer civilian applicants for aviation medical certification. As part of the routine profile of examinations, a comprehensive standardized neurological history and examination is performed on each of these airmen. The population is roughly divided into 50% flying personnel and 50% air traffic controllers. The design of a comprehensive screening neurological examination for use on an apparently normal population is discussed. Positive findings from the present and past histories, family histories, and neurological examinations, together with occupational correlations are indicated. It is shown that in this supposedly superior "normal" population, a high frequency of neurological abnormality exists and is well correlated with occupation. The significance of some of the specific findings is discussed.

A64-80837

MOTION PERFORMANCE OF PRESSURE SUITED SUBJECTS UNDER ZERO AND LUNAR GRAVITY CONDITIONS.

John C. Simons, Dieter E. Walk, and Charles W. Sears.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 64-70.

The motions of unsuited and pressure suited subjects performing lunging, egressing, and landing tasks under zero and lunar gravity conditions were studied. The subjects were timed and filmed during each trial as they accomplished the motions during the weightless and lunar gravity maneuvers of a large cabin aircraft. Performance data are presented for various combinations of clothing, gravity, and body position conditions. Time and contact data are presented for the egress motion as it is influenced by changes in exit area. Orientation problems and maneuvering techniques as influenced by area and volume restrictions are discussed.

A64-80838

COMPARISON OF SEAT ESCAPE SYSTEMS USING THE LATEST PROPULSION CONCEPTS.

Clifford C. Woodward and Marvin Schulman (Naval Air Engr. Center, Aerospace Crew Equipment Lab., Philadelphia, Pa.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 83-86.

Three seat escape systems utilizing a solid type propellant rocket motor in combination with a standard type catapult are under consideration. Such motors are safe to handle, are impervious to shock and temperature variations, and do not deteriorate rapidly. Ejection at zero airspeed, zero altitude 50kts, and 20° nose down within safe physiological acceleration limits is the

goal. Compatibility with the Martin-Baker seat is desirable. The following three systems are discussed: (1) The RAPEX III (Rocket Assist Personnel Ejection Catapult) by NOTS, which consists of a ballistic catapult and rocket motor combined in one sealed unit attached to the stationary main beam of the seat. (2) The Martin-Baker 3-tube ballistic type catapult, used with the MBA seat. A separate rocket pack attached to the bottom of the seat bucket is fired through an angle of 14° rearward. (3) The U.S. SBR (Seat Bucket Rear) Escape System consisting of a 40-inch power stroke catapult using a Navy MK-1 MOD-2 cartridge for initial ejection and two rocket motors attached to the main beam of the seat bucket. Relative merits of each system are considered.

A64-80839

METABOLISM OF SOME SNAP RADIONUCLIDES IN MINIATURE SWINE.

R. O. McClellan and L. K. Bustad (Gen. Elec. Co., Biol. Lab. and Hanford Labs., Richland, Wash.)

Aerospace Medical Association, 35th Annual Scientific Meeting Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 93-95. 11 refs.

Contract No. AT(45-1)-1350.

The possibility of accidental ingestion of Sr^{90} , Ce^{144} , and Pm^{147} radionuclides by persons engaged in processing them for System for Nuclear Auxiliary Power (SNAP) devices or in the use of these devices, has stimulated interest in their metabolism and toxicity. Nuclides were administered by oral route and intravenously into miniature swine, which have certain physiological characteristics in common with man. The body burden of the animals was estimated in the shielded facility with a $\text{NaI}(\text{Tl})$ crystal. The excreta were radioanalyzed. Representative tissues of sacrificed animals were dried, ashed, and dissolved in nitric acid. Beta activity was determined in a beta counter; gamma activity was estimated in a $\text{NaI}(\text{Tl})$ crystal well counter. After oral administration, the body burden remained high for several days, then dropped to low levels as the nuclides were excreted in feces indicating poor absorption. Body retention was within low limits of less than 0.5 percent. After internal administration, retention was about 80 percent of the administered dose.

A64-80840

EMERGENCY ESCAPE SYSTEMS FOR ARMY HELICOPTERS.

Manuel Weinstock (Frankford Arsenal, Philadelphia, Pa.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 99-102.

Tests performed at the Frankford Arsenal Experimental Range, Ft Dix, N.J., indicate that emergency escape systems for helicopters utilizing an L-shaped trajectory are both feasible and practical. This unconventional escape trajectory was selected to permit the removal of a crewman from a disabled helicopter with a minimum of mechanical circumstances. It translates the man in a sideward direction a distance far enough to clear the rotor blades, and thereafter raises him to a sufficient height, so that he may be separated from his seat and safely lowered by parachute. Development of a prototype demonstrator of such a system is desirable, since it would facilitate realistic determination of system performance, weight, cost, and effectiveness.

A64-80841

BIOLOGICAL EFFECTS OF A HORIZONTAL HOMOGENEOUS VERSUS INHOMOGENEOUS MAGNETIC FIELD ON MICE.

B. D. Fremming, F. L. Bellino, J. D. De Leo, R. J. Blinzley, and A. Zervins (Westinghouse Res. and Develop. Center, Blosci. Sect., Pittsburgh, Pa.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 110-113.

The experiment was based on a limited number of two strains of mice exposed continuously for 14 days to homogeneous versus inhomogeneous magnetic fields in which ripple effect was undetectable and temperature controlled. A decrease of 28.1% in the white blood cell count occurred in mice exposed to a horizontal axis, inhomogeneous field (4,000 to 7,400 oersted). An increase of 30.5% in the red blood cell count, as well as an increase of 14.3% in the hemoglobin, occurred in the mice exposed to a horizontal axis, homogeneous field (8,500 to 8,900 oersted).

A64-80842

CHEMICAL ANALYSIS OF PERMANENT AND ORGANIC GASES IN A 30-DAY MANNED EXPERIMENT.

William H. Toliver, Sr. and Melvin L. Morris (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 114-117. 7 refs.

Chemical analysis techniques suitable for closed cabin atmospheres are investigated. Such atmospheres consist of fixed or permanent gases (hydrogen, oxygen, nitrogen, methane, carbon monoxide, carbon dioxide, ozone, and oxides of nitrogen) and of organic compounds whose vapor pressure at ambient temperature (about 25° C.) renders them volatile. Gas chromatog-

raphy was found to be a versatile, efficient, and dependable method of fixed gas analysis. For concentrations in excess of 100 p.p.m. the procedure becomes easily routine; for much smaller concentrations some concentration technique is usually indicated. For volatile organic compounds the most successful concentration technique was found to be the collection of gas chromatograph fractions.

A64-80843

A PROPOSED UNIVERSAL SYMBOL FOR DRUG HAZARDS IN AVIATION. Harold J. Richard (Southern Calif. U., Aerospace Safety Div., Dept. of Aerospace Physiol., Los Angeles).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 120-123.

The continuing problems of drug hazards and self-medication among aviation personnel was presented. The use of symbols as warnings, on a universal basis, was discussed. The obvious and critical need for a similar symbol that would immediately warn aviation personnel of the possible and probable dangers associated with the ingestion of many drugs, especially with self-medication was stressed. Accordingly, a universal safety symbol for drug hazards in aviation, formulated along certain established guide lines and containing a number of desirable elements was designed and proposed for adoption.

A64-80844

THE EFFECT OF PROLONGED ACCELERATION ON EATING AND PERFORMANCE.

Julaine Beasley and Barbara Seldeen (NASA Ames Res. Center, Behavioral Psychol. Lab., Moffett Field, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 124-127.

Rats exposed to acceleration for 5 hours showed a loss of food intake when fed after removal from the centrifuge. However, food intake began to recover significantly within 1 1/2 hours after acceleration. On the fixed-ratio schedule, acceleration depressed overall response rate. The data suggested that local response rate was not disrupted. Acceleration sessions altered response time for animals on the timing problem. Interresponse times were shifted upward to 20-25 seconds. There appeared to be an abrupt recovery toward the end of the session.

A64-80845

PHYSIOLOGICAL ADAPTATION OF THE HUMAN TO INCREASED GRAVITATIONAL FORCE.

D. R. Collier, Jr.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 128-131.

Studies of vestibular and cardiovascular responses to weightlessness, physiological effects of increasing g forces, and physiological adaptation to such forces are reviewed. Physiological adaptation to increased gravitation is the primary area reviewed, and pulse, blood pressure, respiration, and electrocardiographic tracings are monitored. This study demonstrates that physiological adaptation (determined by blood pressure and pulse measurements) of the human to an increase in apparent gravitational force to a 2-g level does occur. That this adaptive mechanism was heavily stressed was shown by fluctuation of measured values and by a breakdown of the mechanism after an interval of time. This loss of adaptation was either acute or subacute. In acute cases, total collapse occurred precipitously. In subacute manifestation, some subjects were able to recover their cardiovascular tone while others continued to decline resulting in termination of the run. No decrement in psychological performance was found barring physiological collapse. Further study is needed to explore and correlate such parameters as exposure duration, rate of rotation, body position, frequency of stimulus, and the interaction of muscular effort to provide optimum benefit.

A64-80846

EXTRA ORAL FEEDING.

T. C. Helvey (South Fla. U., Tampa).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 135.

The human mechanism for alimentation is quite efficient and operates with high reliability. Therefore, it is difficult to establish other pathways through which nourishment can be ingested or administered to the body. However, in astronautics, conditions may demand other means of feeding regardless of the efficiency of the technique. It was considered necessary to survey all the possibilities by which this can be achieved. The paper attempts to list all conceivable ways to provide nourishment for the body. These methods are briefly described with some critical comments. However, the pathology and the efficiency of the different methods is omitted. This paper is presented at a futuristic concept for long-range space flights. It should not be viewed from the near future's practicability.

A64-80847

BIOCHEMICAL MEASURE OF IMPACT STRESS IN CHIMPANZEES.

E. J. Hawrylewicz and W. H. Blair.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 136-138.

Chimpanzees were subjected to various impact stresses and the alterations in serum total lactic dehydrogenase (LDH) and LDH isoenzymes were studied. An increase in the total LDH and marked alterations were seen in serum samples after impact stress. These alterations persisted until autopsies were performed. The altered isoenzyme patterns are probably reflective of the tissue damage induced by the impact stress.

A64-80848

THE RELIABILITY OF THE ELECTRICAL IMPEDANCE PNEUMOGRAPH FOR LONG TERM MONITORING OF RESPIRATORY FUNCTION.

Gale Kaplan (6571st Aeromed. Res. Labs., Holloman AFB, N. Mex.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 139-142.

Feasibility studies were carried out on human subjects and chimpanzees with regard to the impedance pneumograph and compared with results attained by other pneumographic methods (copper sulphate stretch tube and nasal thermistor). The measurements lead to the following conclusions: (1) The impedance pneumograph interacts electrically with the subject while other respiration monitoring devices do not. (2) It requires more frequent adjustment than the nasal thermistor or the stretch tube. (3) It is less reliable than the stretch tube. It has therefore been established that the impedance pneumograph possesses no unique quality to offset the inconveniences it creates.

A64-80849

INTER-SENSORY JUDGMENTS OF SIGNAL DURATION.

Trievie A. Tanner, Jr., R. Mark Patton (NASA Ames Res. Center, Moffett Field, Calif.), and R. C. Atkinson (Stanford U., Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 146-149.

Visual and auditory signals were presented for both inter- and intramodal comparisons of duration using a standard two-choice, forced-choice experimental design. On each trial, two signals of unequal durations were presented; the first signal was longer on one half of the trials, shorter on the other half. The subject's task was to judge which of the two signals was longer by pressing one of the two response switches on the display panel. Discrimination of signal duration was most accurate when two auditory signals were compared. Next most accurate seem to have been judgments comparing the durations of the two visual signals. Additional analysis showed that within the range of durations investigated (0.5 to 1.5 seconds), the tendency to judge the visual signal to be longer than the auditory signal seems to increase as the incremental duration becomes a larger portion of base duration.

A64-80850

SELECTION AND TRAINING REQUIREMENTS SPECIFIC TO BIOMEDICAL AND HUMAN FACTORS RESEARCH IN EARTH ORBITING STATIONS.

Carol C. Cormack and Elsie M. Cole (North Am. Aviation, Inc. Space and Inform. Systems Div., Downey, Calif.)

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 150-153.

The requirements for a crew selection and training program for an earth orbiting research laboratory can be derived from the requirements placed on the crew: by the experimental program of the mission; by the environment of the vehicle; and by the interaction of the environment with the experimental and system operation functions. Integrating these requirements, the selection and training program for the crew of a biomedical and human factors research laboratory housed in an earth orbiting space vehicle must be adequate to supply the crew with the knowledge and skills required to perform intricate and complex biomedical examinations, direct unique measures of performance, be capable of performing complete control and repair actions in the laboratory, and be able to detect unusual events that the experimental program does not pick up. The selection and training requirements are summarized in two tables, and a list of high adjustment potential characteristics is given.

A64-80851

STRUCTURAL-MEDICAL ANALYSIS OF A CIVIL AIRCRAFT ACCIDENT.

A. Howard Hasbrook and J. Robert Dille (Civil Aeromed. Res. Inst., Oklahoma City).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 154-156.

An example of the complexities faced by accident investigators, analysts, and physicians is presented in a case of the crash of a four-place, low-wing aircraft in which two of the three occupants sustained fatal injuries. Detailed

descriptions are given of injuries sustained together with possible structural and material modifications or additions needed to facilitate increased safety. Although forces imposed by the seat belt cannot be ruled out as causing and/or contributing to the internal injuries of the rear seat occupant, the total evidence indicates a good possibility that impact against the rigid steel tube structure of the pilot's backrest was responsible. If this latter conclusion is correct, it would indicate that: (1) backrests of seats should be de-lethalized and (2) a comfortable shoulder harness should be provided for rear seat occupants of small aircraft. In addition, attention should be given to designing seat bottom structure so that it will not fracture the pelvis. Furthermore, the injuries sustained by the front seat occupants show continued need for the design and installation of a comfortable harness for front seat occupants. Coupled with this is the need for improved design of control wheels, their attachments, and the instrument panel to prevent injury to the head and torso. The need for correct diagnosis with respect to possible intra-abdominal injuries is stressed.

A64-80852

METABOLISM AND X-RAY SENSITIVITY OF CHICK EMBRYOS INCUBATED IN A HELIUM-OXYGEN ATMOSPHERE.

R. A. Wright, M. A. Lessler, and H. S. Weiss (Ohio State U., Dept. of Physiol., Columbus).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 157-159.

Chick embryos, which probably are not able to regulate their metabolic rate according to the environmental temperature, should reflect the effects of helium on the cells. Four-day-old nonhomogenized and eight-day-old homogenized chick embryos were used. All irradiated four-day-old embryos showed a significant decrease in oxygen uptake (8%) as compared to those nonirradiated. Four-day-old nonirradiated embryos showed no significant difference between incubation in helium-oxygen or in air. In general, decreased oxygen consumption of eight-day-old homogenized chicks occurs when issues are exposed to radiation in helium, as compared to increased oxygen uptake by tissues when irradiated in 100% oxygen in air.

A64-80853

BIOTECHNOLOGICAL ASPECTS OF SPACE EXTRAVEHICULAR LOCOMOTION.

Leonard M. Seale, George Fejer, Henry Yee, and Nicholas Economou (Bell Aerosystems Co., Aerospace Engr. Dept., Advan. Design Manned Space Systems, Washington, D.C.).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 159.

The requirements imposed on a one-man life support system by the environments encountered by an astronaut operating outside of his spacecraft on Mars, on Venus, and especially on the moon were studied. Diurnal variations of the external environment as well as the effect on the life support and protection system of the means of locomotion were considered. The study shows that the disposal of the metabolic heat and prevention of cross-contamination (by bacteria, spores, etc.) are two major problems subject to the qualifications: the operator is periodically wearing a protective suit 12 hours at a time, and contamination must be prevented. Danger from meteoroids and external heat input are not serious for operations in cisor trans-lunar space and on the moon. Suits, in the manner of hard shells, would protect man on Venus. An insulated protective suit designed for extravehicular operation on the moon would suffice to operate in orbit and during the Martian day. With the exception of the case of Venus, the vehicle used for locomotion has little effect on the life support and protective system, if the protective suit is sufficiently insulated. A lightweight propulsion system consisting of suitably placed rockets, fastened with a harness over the exterior of the protective suit would permit maneuvers in orbit and on the moon.

A64-80854

STUDY OF SPEECH DISCRIMINATION IN NOISE OF NAVAL AVIATORS AND NAVAL AVIATION CANDIDATES.

Vernon C. Bragg and James W. Greene.

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 160-161.

The Naval Aviator's Speech Discrimination Test was formulated to provide a measure of the aviator's ability to perform his task in a noisy environment. The test consists of a hundred one-syllable words copied on tape from the CID Auditory Test W-22 records. These words are presented in a background of noise recorded in the SNB (twin-engine Beechcraft) with an overall level of 100 db. and a signal-to-noise ratio of +15 db. Level of noise closely approximates that found in the aircraft. Twenty-four Service Group I and three Service Group III naval aviators between the ages of forty and fifty years were tested using two forms of the test. Mean scores showed no difference between groups, despite differences in threshold acuity for pure tones. Retest revealed an expected improvement due to practice. The test is proposed as a realistic method for use in determining the Senior Aviator's qualification to perform in Service Group I.

A64-80855

THE EFFECTS OF STATIC MAGNETIC FIELDS ON BASIC MICROBIOLOGICAL PHYSIOLOGICAL PROCESSES.

Martha D. Berliner and Peter W. Neurath (AVCO Res. and Adv. Dev. Div., Med. Sci. Dept., Wilmington, Mass.).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 162-165.

The effect of magnetic fields on living organisms was studied on a large number of controlled experiments over a period of a year utilizing the luminescent dikaryotic cultures of the *Casidiomycete*, *Panus stipticus*. Petri dishes with the experimental cultures were subjected to a high gradient ($dH/dx \approx 1100$ oe/cm) of a high d.c. magnetic field ($H = 3,500$ oersted), or to a uniform field ($dH/dx < 10$ oe/cm) of 8,000 oersted. The physiological parameter of light emission was chosen, because as a function of cell respiration it can be used as an indicator of the physiological changes within the cell. The temperature was maintained at $\pm 0.5^\circ\text{C}$. The results showed no difference in the general appearance and morphology or in the total light output at the end of the maximum growth phase between the exposed cultures and controls.

A64-80856

POST-MORTEM PULMONARY CHANGES OCCURRING IN MICE EXPOSED TO 100% OXYGEN AT 740 MM HG.

John Q. Durlay (Memorial Hosp., Dept. of Anesthesia, New York, N.Y.).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 166-169. 8 refs.

In order to ascertain the differences in post mortem changes, two groups of mice were studied: one air control group, and the other exposed to oxygen at 740 mm. Hg for 48 hours. Mice autopsied at the end of 48 hours showed very few changes of the lungs similar to those occurring in "oxygen toxicity." The lungs were grossly and microscopically similar to air controls if the mice were removed from the high oxygen environment immediately after sacrifice. If the mice were killed in oxygen, left in oxygen for three hours and then autopsied, the lungs were hemorrhagic, collapsed, and did not float in the fixative. Microscopically, there was slight to marked collapse, congestion, and hemorrhage. It is concluded that delayed autopsy plus continued exposure to high oxygen concentration, produce lung changes like the classical description of animals dying from "oxygen toxicity."

A64-80857

THE ROLE OF FEEDBACK IN ADAPTIVE PERCEPTUAL PROCESSES.

Ronald A. Kinchla (NASA Ames Res. Center, Moffett Field, Calif.) and Richard C. Atkinson (Stanford U., Calif.).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 170-173.

Observers attempted to discriminate whether a 100 msec. 1000 c.p.s. tone, was, or was not added to a constant background of band-limited Gaussian noise. To investigate the influence of feedback, 500 trials a day were run for 24 days on the single-detection task. Only on alternate days did subjects receive information feedback concerning the correctness of each response. In addition, unknown to the subjects, stimulus schedules were presented which made a subject's knowledge of the stimulus given on one trial highly relevant to his estimate of that given on the next trial. Eighteen subjects were run under a schedule where the stimuli on adjacent trials were identical 75% of the time. Six subjects were run on a schedule in which the stimuli were repeated only 25% of the time. Results suggest the following: (1) subjects clearly learned to modify their performances in a manner consistent with the first order conditional presentation schedules, and (2) with feedback, the performance shifts were based primarily on the stimulus (or feedback) on the previous trial. With no feedback, the response occurring on the previous trial was the most important factor. The magnitude of the sequential effects also appears to be attenuated without feedback.

A64-80858

CRASH INJURY ANALYSIS OF X-15 INVERTED IMPACT.

S. R. Mohler, A. H. Schwichtenberg, and E. Blick (Civil Aeromed. Res. Inst., Oklahoma City; Lovelace Found., Albuquerque, N. Mex.; and Okla. U., Norman).

Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 174-177. 23 refs.

Data resulting from a headward to footward ($-G_z$) deceleration accident of near-fatal magnitude are analyzed. Circumstances surrounding the misfortune of the X-15-2 aircraft are described. Tracings of accelerometers and other recording instruments provided quantitative data concerning events occurring prior to, during, and immediately after impact. The analysis reveals that ($-G_z$) impacts may be survived in a range approximating 50 g's of decelerative force over periods of about 10 milliseconds, but are accompanied by the collapse of several vertebrae and the occurrence of a certain amount of soft tissue disruption and contusion. This ($-G_z$) tolerance level is roughly half that reported for footward to headward impacts in the seated position involving similar time durations.

A64-80859**EFFECTS OF TOPISCHEMIA: A TEMPORARY AND LOCALIZED CEREBRAL ISCHEMIA.**

Stanley A. Radvan-Ziemnowicz,
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 178-179. 5 refs.

Topischemia, a new method for studying cerebral metabolism and effects of localized brain ischemization of short duration, is presented. It involves a temporary (10 to 25 minute) reversible arrest of blood circulation inside a central area of the cerebral cortex enclosed by a compression or suction instrument. Both superficial and deep vessels of the cortex and their collaterals are involved. The ischemization may be applied transdurally or directly on the cortex. Deliberate timing permits study of the dynamics of local cerebral reversible and irreversible effects of circulatory disturbances, with vascular permeability, breakdown and recovery of blood-brain barrier, and the selective vulnerability of various cerebral elements. Acceleration and deceleration forces produce disturbances in cerebral circulation which are, probably, similar to or identical with changes observed during experimental or clinical topischemia. Functional and structural reactions to hypoxia, asphyxia, and trauma of the brain require extensive study with the described technique.

A64-80860**A STUDY OF AN INSTRUMENTED ANALYTICAL SYSTEM FOR EXTRA-TERRESTRIAL STUDY OF ATMOSPHERES, POSSIBLE LIFE FORMS, AND SOILS.**

E. A. Botan, J. Phaneuf, and J. Lambert (Avco Res. Center, Wilmington, Mass.)
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 180-182.

A compact, lightweight instrument package is proposed that can be landed on an extraterrestrial body. This system will sample and analyze the environment by means of ultraviolet, visible, and infrared microspectroscopy, microscopy, and emission spectrometry. The data obtained will be converted to telemetry signals for transmission to earth. It consists of: (1) a device for sampling the surface and reducing particles to dust by means of a diamond grit belt; (2) a vacuum cleaner type device for collecting abraded matter; (3) a conveyor belt to which the particles are attached by means of a static charge; (4) an absorption spectro-microscopy analytical station consisting of: (a) a microscope attached to sensors for passage of monochromatic light of various wavelengths and (b) a TV microscope for determination of size, shape, and structure; (5) an emission spectroscopy analytical station for further sample studies.

A64-80861**DYNAMICS OF THE SEMICIRCULAR CANALS COMPARED IN ROLL, PITCH AND YAW.**

W. Barry, G. Melvill Jones, and N. Kowalski (McGill U., Defence Res. Board of Canada Aviation Med. Res. Unit, Montreal, Canada).
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 183-186.

Using an electronically controlled turntable, subjects were exposed to post-rotational stimuli with the head oriented to receive these stimuli in yaw, roll, or pitch. The subsequent time course of decay of both sensation of rotation and vestibulo-ocular response (slow phase angular velocity of the eye) were compared for each of these conditions. The method of cupulometry was employed for measuring rotation sensation, using angular velocity stimuli of 60°, 40°, 10°, and 5°/second to left and right. D. C. electro-oculography and a cineoculographic technique were employed to measure eye movement, using single angular velocity stimuli of 60°/second to left and right. Results show that the rate of decay of post-rotational response, and hence presumably of cupular restoration in the canal system, was some 2 to 4 times more rapid for stimuli applied in roll and pitch than in yaw. This implies that the rate of intrusion of canal errors during a prolonged turn is also more rapid for rotation in the planes of roll and pitch than in that of yaw.

A64-80862**PREDOMINANCE OF ANTI-COMPENSATORY EYE MOVEMENT DURING RAPID HEAD ROTATION.**

G. Melvill Jones (McGill U., Defence Res. Board of Canada Aviation Med. Res. Unit, Montreal, Canada).
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 187-189.

Angular eye movements were measured in subjects with eyes shut and head fixed to a turntable in erect position to eliminate vision and neck proprioception contributing to the response. Yaw movements of aircraft were simulated by horizontal rotation of the turntable to left and right through approximately 40°. Normal response of quick anticompany response, which serves to maintain the eye in a desired position in the skull during normal head rotation, proved to be a disadvantage during more prolonged and violent movements. It prohibited, temporarily, fixation of the retinal image thus prejudicing visual fixation and making clear vision virtually impossible.

The absence of vision and neck proprioception indicated the vestibular role in the predominance of the anticompany response.

A64-80863**NUTRITIONAL ACCEPTABILITY OF A FREEZE-DEHYDRATED DIET.**

E. W. Speckmann, J. E. Vanderveen, K. J. Smith (6570th Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio), G. M. Homer, and D. P. Wiltse (Miami Valley Hosp. Res. Dept., Dayton, Ohio).
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 197-200.

Data are presented indicating that a four-day cycle menu consisting only of precooked freeze-dehydrated food items was both acceptable and nutritionally adequate and rated equally with a matched control diet. No evidence of monotony could be detected in either the freeze-dehydrated food items or the freshly prepared food items during the 20-day feeding trial. The subjects did not notice an increased gas production of one diet over the other nor did they reveal extreme dislikes for particular items.

A64-80864**AGE DIFFERENCES IN SEQUENTIAL DECISIONS AND CARDIOVASCULAR STATUS AMONG PILOTS.**

Jacek Szafran (Lovelace Found. for Med. Educ. and Res., Dept. of Exptl. Psychol., Albuquerque, N. Mex.)
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 201-206. 18 refs.

The effects of aging such as fatigue and decreased vigilance are evaluated on the basis of those aspects of sequential performance which call for the exercise of fast judgment and decision vital in high-grade skills such as pilot performance. The preliminary results of a study still in progress suggest that: (a) In a sample of individuals representing the aircraft pilot profession, age differences in the rate of information gain were less impressive than might be expected from other data in the field of gerontology; (b) Pilots over forty were relatively more susceptible than the younger to the effects of information overload, particularly if this involved short-term recall when some other activity intervened during periods of retention; (c) Although the slowing with age, observed in the face of additional information challenges, is equivalent to reducing the rate of transmission of information, it does not unequivocally suggest a reduced capacity for discrimination and choice.

A64-80865**EARLY DIAGNOSIS OF CARDIOVASCULAR DISEASE AMONG AIR-CREW.**

H. W. Kirchhoff and E. A. Lauschner (AF Inst. of Aviation Med., Fürstenfeldbruck, Germany).
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 207-209.

An early detailed diagnosis, including all possibilities of detecting pre-formation of the several functional or organic disturbances of the cardiovascular system, can be achieved by several tests: (a) general cardiovascular efficiency under determined workload, (b) determination of parameters under hypoxia, and (3) master test in compression chambers. Systematic application of these methods can be useful in determining which aging pilots can maintain their flying status after a program of treatment, suggested training, and psychotherapeutic supervision.

A64-80866**EFFECTS OF MAGNETIC FIELDS ON THE GROWTH OF ALGAE.**

M. H. Halpern and J. J. Konikoff (Gen. Elec. Co., Space Sci. Lab., Philadelphia, Pa.)
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 210-212.

The effects of magnetic fields were studied on a high salt medium strain and a chick strain of *Chlorella pyrenoidosa*. Identical environmental conditions of light, temperature, and medium were maintained. The following were the variable factors: (1) magnetic field of 750 and 1,000 gauss from a permanent magnet and (2) a d.c. electromagnetic field of 4,000 and 20,000 gauss. The readings were expressed as growth indices, which were converted to relative growth effect. In the 750 gauss field the effect was almost identical in both strains. At 1,000 gauss, the high salt medium strain was not affected while the second strain showed the same degree of inhibition as at the 750 level. In the d.c. field of 4,000 gauss, the effect was of the same order until the fourth day when a progressive enhancement of growth was noted.

A64-80867**IDENTIFICATION OF VARIABLES IN ACCELERATION PHYSIOLOGY.**

Kenneth R. Coburn (Naval Air Engr. Center, Aerospace Crew Equipment Lab., Philadelphia, Pa.)
Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 213.

A review of the literature on early acceleration data, which can be applied to problems involving supersonic aircraft and manned spacecraft, points to the necessity of clearer definition of some factors such as: (a) rate of onset; (b) peak g-level attained and its duration; (c) physical dimensions and performance characteristics of the centrifuge; (d) posture angles; (e) seated height—centrifuge radius ratio; (f) transducer locations; (g) anesthetics and drugs employed; (h) surgical manipulation of subjects; and (i) selection and validity of endpoints.

A64-80868

MANNED OPERATIONS IN NUCLEAR SPACE SYSTEMS.

John T. Celentano, Dominic Amorelli, George D. Kohler, and Brice G. Peters (North Am. Aviation, Inc., Space and Inform. Systems Div., Downey, Calif.) Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 219-220.

Future developments of nuclear space systems utilizing reactors of solid core thermal or fast neutron types or gaseous and liquid cores present problems of protecting the spacecraft crew from high doses of radiation. Potential hazards are: (1) release of neutron and gamma rays in criticality of accidents; (2) release of fission products into the manned compartment; or (3) improper operation and maintenance techniques. A special multichannel spaceborne system for operating the reactor incorporating an emergency shutdown device could be used, which would monitor neutron flux, reactor period, coolant temperature and flow, levels of radioactivity, and accumulation of radioactive doses at several points. Inconsistent readings due to instrument failure would be taken care of automatically without shutdown. In determining the safe dosage from the reactor, the maximum mission dose, background galactic and Van Allen Belt radiation must be considered.

A64-80869

MASSIVE UPPER GASTROINTESTINAL HEMORRHAGE IN FLYING PERSONNEL.

Dudley B. Houle, Paul R. Hanson, Howard R. Unger, and Alonzo A. Towner. Aerospace Medical Association, 35th Annual Scientific Meeting, Americana Hotel, Bal Harbour, Fla., May 11-14, 1964. Preprints of Scientific Program, p. 221-223.

Massive upper gastrointestinal hemorrhage (estimated or measured rapid blood loss of greater than 1,000 cc. as manifested by shock, fainting, hypotension, or laboratory measurements) in flying personnel should be regarded as a unique entity. Recurrent bleeding is more common in this group than in the civilian population. Return to flying status in the Air Force after massive upper gastrointestinal hemorrhage is a long, difficult administrative process. Because of the threat of rebleeding in the medically treated patient, the poor results from intermittent medical therapy, and the improved opportunity to regain flying status, consideration of early surgery should be entertained by the flight surgeon entrusted with the care of the flyer suffering with upper gastrointestinal hemorrhage. A single massive hemorrhage is felt to be an indication for surgical intervention.

A64-80870

THE ACTIVATING EFFECT OF VESTIBULAR STIMULATION ON THE ELECTROCORTICOGRAM (AKTIVIRUIUSHCHEE VLIANIE VESTIBULIARNOGO RAZDRAZHENIYA NA ELEKTROKORTIKOGRAMMU).

G. I. Gorgiladze and V. M. Fedorov. Doklady Akademii nauk SSSR, vol. 155, Mar. 1964, p. 478-481. 18 refs. In Russian.

In cats, polarization of the labyrinth by direct currents of different duration caused an appearance of waves of high frequency and low amplitude. Weaker polarization produced pronounced activity in the vestibular analyzer of the cortex. Normalization was noted 20 to 30 seconds after the current was interrupted. An increase in current intensity produced a greater effect until a point was reached above which the electrocorticogram (ECG) registered spikes, which persisted even after chemical suppression of the labyrinth activity of the intracranial section of the vestibular branch of the acoustic nerve. In the reticular formation of the midbrain, polarization produced waves of high frequency and low amplitude. However, in some cases, high-amplitude synchronous waves were noted. Activation was not affected by removal of both cortical motor zones, vestibular projection areas, or cerebellum. Vestibular stimulation resulted in greater ECG activity than pain, proprioceptive stimulus, sound, or light.

A64-80871

THE EFFECT PRODUCED BY POLARIZATION OF THE LABYRINTH ON THE CONDUCTION OF STIMULI IN THE OPTICAL SYSTEM (VLIANIE POLIARIZATSII LABIRINTA NA PROVEDENIE VOZBUZHDENIYA V ZRITEL'NOI SISTEME).

G. I. Gorgiladze and G. D. Smirnov. Doklady Akademii nauk SSSR, vol. 155, Mar. 1964, p. 230-233. 12 refs. In Russian.

In cats, polarization of the labyrinth by direct current caused changes in the irritability of the visual system. In the brain cortex, polarization suppressed the positive and negative phases and subsequently, the components of the brain potentials of the visual area induced by single light flickers. Current

interruption produced normalization within 20 to 30 seconds. On the other hand, the effects of continuous stimulation by 10 to 15 flickers per second were amplified by polarization. The effects of single or continuous stimulation of the optic nerve or a specific thalamic area by the electric current were modified by labyrinth polarization. Changes in the general cortex rhythm were observed simultaneously with these effects. These results together with the findings on the stimulation of the reticular formation and skin pain effects indicate an involvement of the reticular formation in the polarization effect.

A64-80872

THE EFFECT OF CONSTANT MAGNETIC FIELD UPON THE MOTIVE ACTIVITY OF BIRDS (VLIANIE POSTOYANNOGO MAGNITNOGO POLIA NA DVIGATEL'NUIU AKTIVNOST' PTITS).

A. L. El'darov and Iu. A. Kholodov (USSR, Acad. of Sci., A. N. Severtsov Inst. of Animal Morphol., Moscow). Zhurnal Obshchei Biologii, vol. 25, May-Jun. 1964, p. 224-229. 9 refs. In Russian.

A magnetic field of 0.6 to 1.7 oersted, under conditions of constant atmospheric pressure, temperature, humidity, and steady illumination, increased the frequency of body movements in birds. A one-hour latent period was noted before the increase was observed. The effect persisted a short period of time after the magnetic stimulus was interrupted. The intensity of illumination modified the character of movements. The most pronounced increase was noted under weak light conditions. Changes in amplitude and in dynamics were recorded. However, no other specific effects were observed. It may be concluded that birds respond to earth magnetism; but their sense of orientation is not directly affected by it.

A64-80873

DYNAMICS OF SKIN-GALVANIC REACTIONS IN CONTROL PANEL OPERATORS DURING THEIR WORK OF REGULATING AIRPLANE TRAFFIC (DINAMIKA KOZHNO-GALVANICHESKIKH REAKTSII U DISPATCHEROV V USLOVIYAKH NAPRIAZHENNOI RABOTY ZA PUL'TOM UPRAVLENIIA DIVZHENIEM SAMOLETOV). L. B. Kozarovitskiy (Moscow U., Dept. of Physiol., USSR). Zhurnal Vyshei Nervnoi Deiatel'nosti, vol. 14, May-Jun. 1964, p. 387-396. 16 refs. In Russian.

In inexperienced airline dispatchers the galvanic skin responses deviated from normal due to fatigue at the end of a working day or under tension. The character of tracing showed diminishing skin resistance, either an increase or a decrease in amplitude in different individuals, and a decrease in frequency. Destruction of attention tended to lower the skin resistance which depends on stimulating and suppressing processes. Experienced subjects showed fewer sharp variations, less fluctuations in amplitude, a faster fading of the response, and less reaction to the extraneous stimuli.

A64-80874

EFFECT OF HYPERTHERMIA ON PLASMA CATECHOLAMINES AND HISTAMINE.

P. N. Symbas, M. Jelinek, T. Cooper, and C. Hanlon (St. Louis U., School of Med., Center for Cardiovascular Res., Dept. of Surg., St. Louis, Mo.) Archives Internationales de Pharmacodynamie et de Therapie, vol. 150, Jul. 1964, p. 132-136. 9 refs. Grants No. PHS-G-HE-06312; PHS-G-HE-03826, John A. Hartford Found.; and St. Louis Heart Assoc.

Plasma catecholamine and histamine contents were measured in dogs subjected to lethal levels of total body hyperthermia. Significant elevation in circulating catecholamines was observed at temperatures between 40.5° and 41.5° C. Plasma histamine content was modestly elevated. It is suggested that the liberation of these vasoactive agents into circulation may exert untoward influences on cardiovascular performance.

A64-80875

DESIGN AND EVALUATION OF A VENTILATED GARMENT FOR USE IN TEMPERATURES UP TO 200° C.

G. W. Crookford and R. F. Hellon (U. of London, London School of Hygiene and Tropical Med., M.R.C. Environmental Physiol. Res. Unit, England). British Journal of Industrial Medicine, vol. 21, Jul. 1964, p. 187-196. 18 refs.

British Iron and Steel Res. Assoc. supported res.

Experiments are presented investigating the most suitable form of insulation in a hot entry suit for use primarily in furnace wrecking where mean radiant temperatures of 200° C. are met and where heat-reflecting garments are unsuitable due to the rapid deterioration of the reflecting surface. A new form of ventilation was developed in which air flows out through a permeable suit (radial ventilation). This form of ventilation produces what is called dynamic insulation, and this method of insulation, when compared with two alternative methods on a physical model, was found to be very effective. Physiological measurements made on subjects and physical measurements made on the suits confirmed that dynamic insulation is the most suitable for a hot entry suit for furnace wrecking. With the air flows used in these experiments, dynamic insulation had a thermal conductance one-fifth that of conventional static insulation, and sweat losses and oral temperature rises were reduced by one-third and one-half, respectively.

A64-80876

ELEVATED RIBOFLAVIN LEVELS IN URINE OF FASTING HUMAN SUBJECTS.

H. G. Windmueller, A. A. Anderson, and Olaf Mickelsen (Nat. Inst. of Health, Nat. Inst. of Arthritis and Metab. Diseases, Bethesda, Md.)
American Journal of Clinical Nutrition, vol. 15, Aug. 1964, p. 73-76. 8 refs.

The urinary excretion of riboflavin in fourteen of fifteen normal subjects increased during a 24- to 37-hour fast. In most subjects, the increased rate of excretion did not start until 13 to 20 hours after the last meal. The total 24-hour riboflavin excretion during the fast was about twice that for the last day when food was consumed. Toward the end of the fast, the excretion rate of riboflavin in some subjects was ten to fifteen times that for the control day. The amount of nitrogen and creatinine excreted during the fast was essentially the same as for the control day.

A64-80877

CALORIC EXPENDITURE AT TWO TYPES OF FACTORY WORK.

Harry A. Bliss and John S. Graettinger (Ill. U., Coll. of Med., Dept. of Med., Chicago).

Archives of Environmental Health, vol. 9, Aug. 1964, p. 201-205. 11 refs.
American Heart Assoc., Chicago Heart Assoc., Illinois Heart Assoc., United States Public Health Serv., Otho S. Sprague Found., Res. and Education Committee of the Presbyterian-St. Luke's Hosp., and Illini Found. supported research.

Indirect measurement of caloric expenditure in men doing heavy or light work revealed that the employer's relative index of the physical demand imposed by various jobs was valid. In subjects working at similar jobs not requiring lifting, caloric expenditure was closely related to body weight. The dependence of pulmonary ventilation on energy expenditure was close and did not vary in the two groups of men.

A64-80878

BODILY REACTIONS TO HIGH TEMPERATURE.

Khalil G. Wakim (Mayo Clinic and Mayo Found., Rochester, Minn.)
Anesthesiology, vol. 25, Jul.-Aug. 1964, p. 532-548. 111 refs.

Physiological responses to high environmental temperature and hyperthermia are reviewed. The following aspects in this area are included: (1) effects of anesthesia and operation, (2) cardiovascular effects in general, (3) heart rate and rhythm, (4) cardiac output, (5) blood volume, (6) blood constituents, (7) body fluids and electrolytes, (8) vascular reactions, (9) blood pressure, (10) cardiovascular adjustments, (11) renal effects, (12) respiratory effects, and (13) physiological adaptation to heat.

A64-80879

ENVIRONMENTAL COLD AND MAN.

I. Cary Andrews and Louis R. Orkin (Yeshiva U., Albert Einstein Coll. of Med., Dept. of Anesthesiol.; and Bronx Munic. Hosp. Center, Dept. of Anesthesiol., New York City).

Anesthesiology, vol. 25, Jul.-Aug. 1964, p. 549-559. 93 refs.

Various physiological effects of environmental cold on man are reviewed together with discussions of special problem areas. The following are included: metabolism, respiration, circulation, blood, central nervous system, kidneys, liver, acclimatization, and accidental hypothermia. It is concluded that knowledge of basic physiological and pathological consequences of body cooling is far from complete and that the interplay with anesthetic depression is also not clear.

A64-80880

CHANGES IN THYROIDAL COLD RESPONSE OF HEAT-ADAPTED RATS FOLLOWING BILATERAL LESIONS OF THE HABENULAR NUCLEI.

B. Mess (Med. U., Inst. of Anat., Pécs, Hungary).

Acta physiologica Academiae Scientiarum hungaricae, vol. 24, 1964, p. 299-304. 15 refs.

The response to cold of the thyroid has been studied in heat-adapted albino rats following bilateral lesions of the habenular nuclei. Exposure to slight cold (14° C) produced an elevation of the Thyroid:Serum iodide ratio (T/S ratio) in intact controls. This response was exaggerated in lesioned rats exposed to slight cold. No rise in T/S ratio occurred in rats exposed to severe cold (0° to 4° C) in intact controls or in rats bearing habenular lesions. The adrenal weights were higher in rats exposed to severe cold. The increase in adrenal weights was more significant in lesioned rats exposed to severe cold than in intact rats under the same circumstances. It has been concluded that the habenular nuclei play an important role in TSH-thyroid activation provoked by exposure to cold.

A64-80881

DIURNAL RHYTHM OF CELL DIVISION IN TISSUE CULTURES.

N. I. Zaskal'ko (Inst. of Exptl. Med., Lab. of Exptl. Histol., Leningrad, USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, May 1963, p. 104-108.

Bulletin of Experimental Biology and Medicine, vol. 55, Jul. 1964, p. 572-576. 19 refs. Translation.

Changes in diurnal mitotic activity of freshly prepared cell cultures of rat renal cortex, and the continually propagated strain of HeLa cells were studied under identical laboratory conditions. No definite regularity in the mitotic rhythm was noted in samples taken every 3 or 6 hours during a 24-hour period. Maximum mitotic activity was not associated with any definite time of day.

A64-80882

THE EFFECT OF EXERCISE ON TEMPERATURE REGULATION.

Pamela A. Bradbury, R. H. Fox, R. Goldsmith, and I. F. G. Hampton (Nat. Inst. for Med. Res., Div. of Human Physiol., Hampstead, London, England).
Journal of Physiology, vol. 171, Jun. 1964, p. 384-396. 23 refs.

Twenty subjects were divided into five equal groups. Three groups were acclimatized to heat (38.5° C.) by twelve daily sessions of 1 hour of controlled hyperthermia while they were either resting or working at one of three different levels of energy expenditure. The other two groups acted as controls. All the subjects were tested before and after the period of acclimatization in a series of three standard tests to measure the changes in their levels of acclimatization. There were marked differences between the physiological responses of the groups in the first set of standard tests. This made it difficult to evaluate the effects of working compared with resting on acclimatization, but no obvious differences were observed. The results obtained during the sessions of controlled hyperthermia showed that sweat losses during work were significantly higher than at rest ($P < 0.01$ to < 0.001). The most likely explanation of these observations is that exercise directly stimulates sweating. It is suggested that the rise in deep body temperature normally observed during exercise is due partly to the proportional nature of the control mechanism and partly to the fall in skin temperature which locally inhibits the heat dissipating responses.

A64-80883

THE EFFECT OF SOME DRUGS ON THE MAXIMAL CAPACITY OF ATHLETIC PERFORMANCE IN MAN.

R. Margaria, P. Aghemo, and E. Rovelli (Milan U., Ist. di Fisiol. Umana, Italy).
Internationale Zeitschrift für angewandte Physiologie, vol. 20, 1964, p. 281-287. 14 refs.

The effects of certain drugs on (a) the maximum oxygen consumption, (b) the time of performance in an anaerobic exercise, (c) the blood lactic acid, and (d) the maximum heart rate of three trained subjects were studied. The exercise was a run on a treadmill at 12 and 13.8 kilometer/hour on a 5% incline carried until exhaustion (about 5-6 minutes). The drugs administered with a double-blind system, were amphetamine (10 mg.), caffeine (100 mg. and 250 mg.), ascorbic acid (250 mg.), and flavon-7-ethyle ossiacetate ("Recordil", 90 and 180 mg.); the placebo was starch (250 mg.). Five tests were made for each drug and for each subject. The statistical analysis of the data shows that the drugs have no significant physiological effect on any of the tests made.

A64-80884

THE EFFECT OF SUPPLEMENTARY FEEDING ON PLASMA FREE FATTY ACIDS DURING WORK.

Milton Mager, Ralph F. Goldman (US Army Res. Inst. of Environ. Med., Natick, Mass.), and P. F. Lampietro (Civil Aeromed. Res. Inst., Environ. Physiol. Branch, Oklahoma City, Okla.)

Metabolism, vol. 13, Sep. 1964, p. 823-830. 19 refs.

Multiple challenges with exercise were instituted after an overnight fast in trained normal subjects. The repetitive experiments were designed to assess whether the metabolic response could be affected by hydration or by the ingestion of various caloric supplements which, however, were insufficient to provide the caloric requirements during the treadmill work. The studies indicate that the plasma increments in free fatty acids (FFA) during work were conditioned by hydration, and could be attenuated by exogenous nutrients. The carbohydrate content of the nutrients rather than their total caloric yield was the major determinant of their effectiveness in inhibiting the FFA response to exercise.

A64-80885

DIRECT DETERMINATION OF THE MEAN NITROGEN CONCENTRATION IN CONNECTION WITH NITROGEN WASHOUT WITH MULTIPLE BREATH METHOD.

T. Lundman, E. Orinius, and I. Ståhle (Seraphimerlasarettet, Karolinska Inst., Depts. of Med. and Clin. Physiol., Stockholm, Sweden).
Scandinavian Journal of Clinical and Laboratory Investigation, vol. 16, 1964, p. 332-338. 5 refs.

In nitrogen washout, according to the multiple breath method, the apparatus has been so arranged that the expired gas is homogenized on the way to the nitrogen analyzer, which thereby shows the approximate mean concentration, breath by breath. In a normal group of 36 healthy men and women, the nitrogen washout delay has been determined as 0% to 85% (2 standard deviations). A pathological material comprising 14 cases of chronic bronchitis, asthma bronchiale, emphysema, etc. showed values between 90% and 1050%.

A64-80886**COMPARISON OF HUMAN AND COMPUTER ELECTROCARDIOGRAPHIC WAVE-FORM CLASSIFICATION AND IDENTIFICATION.**

S. Yasui, Gerald H. Whipple, and Lawrence Stark (Mass. Inst. of Technol., Biol. Dept., Electron. Systems Lab., Neurol. Section, Cambridge; Boston U. School of Med., Dept. of Med., Mass.)

American Heart Journal, vol. 68, Aug. 1964, p. 236-242. 8 refs. Grants No. NIH-G-NB-3090; NIH-G-MH-06175-01A1; NIH-G-HTS-5136; and MHA-G-521.

A program for the automatic interpretation of the QRS complex by pattern recognition techniques is described. Considerable similarity to human pattern recognition, both classification and identification, is demonstrated, particularly with the use of selective weighting of different portions of the QRS complex. The method also initially rejects much less information from the input curve than do techniques based only on point recognition, particularly since there is no need for transformation of the signal out of the time domain. It is believed that the described method, extended and combined with other techniques, holds great promise for automatic interpretation of the electrocardiogram by means of digital computation.

A64-80887**MODERN PROBLEMS OF TOXICOLOGY AND PREVENTIVE MEDICINE BROUGHT ABOUT BY THE USE OF MISSILE PROPELLANTS (MODERNI PROBLEMI DI TOSSICOLOGIA E DI MEDICINA PREVENTIVA DERIVANTI DALL'IMPIEGO DI PROPELLENTI PER MISSILI).**

Renato Pons (Centro Studi di Med. Navale, La Spezia, Italy). *Annali di Medicina Navale*, vol. 68, Sep.-Oct. 1963, p. 773-796. 19 refs. In Italian.

A discussion is presented on toxic missile fuels and propellants including red nitric fuming acid, unimetric dimethyl hydrazine, M-3 propellant, nitrogen peroxide, and ethylene oxide. A summary is given of their chemical and toxic properties, and the clinical aspects, symptomatology, and treatment of toxic states. The following recommendations are made for the prevention of acute and chronic injury to personnel working in the area of missile propellants and fuels: (1) selection and preventive instruction of personnel involved in their production and handling; (2) periodic medical examination of all personnel; (3) frequent periodic inspection of work areas to determine hazardous concentrations and to determine safety tolerance levels; (4) obligation of all personnel to adhere to prescribed safety rules and to wear masks when necessary; and (5) instruction of all personnel in first aid.

A64-80888**IS BINOCULAR CORRESPONDENCE AND DISPARITY STILL A DOMINANT FACTOR IN BINOCULAR DEPTH PERCEPTION?**

J. L. Zajac.

Psychological Bulletin, vol. 62, Jul. 1964, p. 56-66. 45 refs.

Laws of binocular correspondence and disparity are regarded as bases for explanations of most of the phenomena of binocular depth perception in the near field of vision. Abnormal phenomena such as differences in astigmatism of the eyes, differences in acuity, and cases of natural aniseikonia, investigated by the author, confirm the validity of the laws of correspondence and disparity and also of the law of intersection of visual directional lines. The inadequacies of other theories of binocular depth perception are pointed out and the author concludes that they cannot supplant the laws of binocular correspondence and disparity for the great majority of cases of binocular perception of depth in the near field of vision.

A64-80889**INDOCYANINE GREEN CLEARANCE AND ESTIMATED HEPATIC BLOOD FLOW DURING MILD TO MAXIMAL EXERCISE IN UPRIGHT MAN.**

Loring B. Rowell, John R. Blackmon, and Robert A. Bruce (Wash. U., School of Med., Dept. of Med., Div. of Cardiol., Seattle).

Journal of Clinical Investigation, vol. 43, Aug. 1964, p. 1677-1690. 42 refs. Grant No. PHS-G-HE-908C12 and Wash. State Heart Assoc.

The fractional clearance rate of indocyanine green (ICG) was determined from peripheral venous samples in 7 men (19 to 37 years old) during rest and upright exercise requiring from 26% to 97% of maximal oxygen intake. An inverse linear relationship was observed between fractional ICG clearance rate as percentage of the resting value and oxygen intake only when the latter was expressed as percentage of maximal oxygen intake. To test the validity of the procedure for assessing alterations in hepatic blood flow with exertion, the fractional clearance rate and hepatic extraction efficiency for ICG and estimated hepatic blood flow (EHBF) were determined. Large decreases, in excess of 80%, in EHBF occur in upright man during severe exertion.

A64-80890**HIGH ALTITUDE PHYSIOLOGY IN RELATION TO ANESTHESIA AND INHALATION THERAPY.**

Peter Safar and Ruben Tenicela (Pittsburgh U., School of Med., Dept. of Anesthesiol., Pa.)

Anesthesiology, vol. 25, Jul.-Aug. 1964, p. 515-531. 115 refs. Contract No. DA-49-193-MD-2160.

When administering anesthetics and in inhalation therapy at altitudes above 3,000 feet several effects of low barometric pressure must be considered: (1) decreased oxygen tension, (2) different physical behavior of gases, and (3) physiological effects of high altitudes. Resulting acute pulmonary edema may be relieved by intermittent positive pressure breathing of 100% oxygen. Gaseous anesthetics must be given in higher concentrations than at sea level to provide the optimum partial pressure. Ether-oxygen and cyclopropane-oxygen anesthesia, reinforced with succinylcholine, together with controlled hyperventilation are satisfactory. Halothane-oxygen is a theoretically sound combination. Nitrogen oxide should be avoided because of the attendant hypoxia. Spinal anesthesia in the Peruvian Andes has been associated with high incidence of cephalalgia and should therefore be combined with oxygen inhalation. Polycythemic residents or newcomers require increased pulmonary ventilation with high oxygen tension when medicated with drugs which depress breathing or consciousness.

A64-80891**ANALYSIS OF THE MECHANICS OF LOCOMOTION [ANALISI DELLA MECCANICA DELLA LOCOMOZIONE].**

G. A. Cavagna, F. P. Saibene, G. F. Santi, and R. Margaria (Milano Univ. Degli Studi, Ist. di Fisiol., Umana, Italy).

Minerva Medica, vol. 55, Mar. 10, 1964, p. 736-739. 6 refs. In Italian.

An objective analysis is made of the mechanics of locomotion using cinematography and accelerometry during movement, especially in vertical, anterior-posterior, or lateral directions. Accelerometric tracings were found to be similar in normal subjects and without appreciable deviations, but showed significant variations in persons with walking disorders. While walking at 4 to 5 kilometers/hr., displacements from the center of gravity were not much different from those of the trunk as seen from accelerometric tracings. During the phase of standing erect (increase of potential energy), there was forward deceleration (decrease of kinetic energy) and vice versa; during the phase of body lowering (decrease in potential energy), acceleration was forward (increase of kinetic energy). A subject stands erect by kinetic energy, and by accelerating forward utilizes potential energy accumulated during the phase of standing erect. In walking, the force exercised by the feet controls the ground and determines direction, essentially vertical. Included are tracings obtained while walking at 4 kilometers/hr., and showing displacement of trunk in vertical direction, standing on right foot, and successive positions seen via cinematography.

A64-80892**THE EFFECT OF HYPERCAPNIA ON THE BLOOD SUPPLY TO THE HEART**

I. N. Kiriushina (Acad. of Med. Sci. of the USSR, Inst. of Normal and Pathol. Physiol., Lab. of Physiol. and Pathophysiol. of Respirat. and Circulation, Moscow).

(*Bulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 55, Apr. 1963, p. 9-14.)

Bulletin of Experimental Biology and Medicine, vol. 55, Jun. 1964, p. 366-369. 15 refs. Translation.

In anesthetized dogs, hypercapnia induced by inhalation of air containing less than 5% CO₂ did not show any appreciable effect upon coronary circulation. Greater CO₂ concentrations (up to 30%) resulted in biphasic changes in coronary blood flow. After 1 to 2 minutes of CO₂ mixture breathing, only the first phase was evident, which showed reduced flow. Blood pressure readings indicated partial constriction of coronary arteries. Longer periods of inhalation resulted in the appearance of the second phase characterized by an increase in blood flow due to dilation of coronary arteries. The second phase was directly related to CO₂ concentration of the inspired air mixtures. Maximum increase in coronary flow usually occurred within the first minute after the animals were returned to breathing air. The electrocardiogram showed various degrees of bradycardia.

A64-80893**ACUTE BRAIN SYNDROME SECONDARY TO TETRACHLORETHYLENE INGESTION.**

A. F. Haerer and H. D. Udelman (Ireland Army Hosp., Med. Corps., Depts. of Neurol. and Psychiat., Fort Knox, Ky.)

American Journal of Psychiatry, vol. 121, Jul. 1964, p. 78-79.

An acute brain syndrome partially resembling the perceptual distortion response to LSD is described in a young man following the ingestion of a conventional dose of tetrachlorethylene for intestinal parasites.

A64-80894**ADAPTATION TO PRISMATIC DISTORTION.**

Herbert L. Pick, Jr. (Minn. U., Minneapolis) and John C. Hay (Smith Coll., Northampton, Mass.)

Psychonomic Science, vol. 1, Jul. 1964, p. 199-200. 8 refs. Grant No. NIH-G-MH-07588-01.

This is a study of the adaptation of human subjects to long-term exposure to optical distortions produced by wedge prisms. Results indicate that the various prismatic distortions are adapted to at varying rates and to varying degrees. Adaptation to the lateral displacement produced by a prism occurs rapidly and completely. Adaptation to certain shape distortions occurs slowly and to a minimal degree.

A64-80895

ON THE ROLE OF THE UPPER RESPIRATORY TRACTS IN AN ORGANISM ACTED UPON WITH IONIZED AIR (O ZNACHENII VERKHNIIKH DYKHATEL'NYKH PUTEI PRI DEISTVII NA ORGANIZM IONIZIROVAN-NOGO VOZDUKHA).
A. M. Skorobogatova (Acad. of Med. Sci., Inst. of Experimental Med., USSR).
Doklady Akademii nauk SSSR, vol. 154, Feb. 1964, p. 1466-1468. In Russian.

In tracheotomized animals, the ionized air passing through the upper respiratory tract was absorbed in different degrees at various points along the tract. Light ions were completely absorbed by the lining of the nasopharynx. In the nasopharynx, heavy ion concentration increased slightly, as compared with the inhaled air. During further passage along the trachea, the degree of heavy ion absorption varied at different levels in different animals. Complete deionization occurred at a distance of 5 to 6 cm, in rabbits, cats, and roosters, whose tracheal diameter was about 20 mm. In dogs with a tracheal diameter of 50 mm., neutralization was noted at a distance of 12 to 13 cm. The degree of deionization indicated a dependency on tubular diameter and passage surface. In tubular passages at laminar flow, the number of interparticular and surface collisions is greater in the direction of flow at smaller diameters. In the pharynx, a higher degree of absorption may be explained by turbulency of flow due to the specific anatomical structure of the cavities and the resulting increased collision probability.

A64-80896

VARIATION IN THE RHYTHMICITY OF THE NEURONS OF THE RETICULAR FORMATION IN THE CASE OF OVERLOADS ACTING IN CROSSWISE DIRECTION (IZMENENIE RITMIKI NEIRONOV RETIKULIARNOI FORMATSII PRI POPERECHNYKH PEREGRUZKAKH).
O. G. Gzenko, B. B. Egorov, A. N. Razumeev, and N. A. Chekhonadskii.
Doklady Akademii nauk SSSR, vol. 155, Apr. 1964, p. 1233-1236. 8 refs.

Transverse acceleration stress applied to cats placed in a centrifuge resulted in variations of the activity rhythm of the neurons in the reticular formation. Three phases were noted: (1) rhythm acceleration, (2) regrouping of the impulses, and (3) complete quiescence. These changes may be due to the action of a stream of afferent impulses on the nucleus of the giant cells in the reticular formation. It is postulated that the effect of acceleration stress is the combined result of two simultaneous processes taking place in the neurons: one increases the number of impulses, while the second suppresses them. The effect of the first process exceeds the second.

A64-80897

SOURCES OF REPORTS OF VISUAL AND AUDITORY SENSATIONS IN PERCEPTUAL-ISOLATION EXPERIMENTS.
Marvin Zuckerman and Nathan Cohen (Albert Einstein Med. Center, Div. of Endocrinol. and Reprod., Res. Labs., Philadelphia, Pa.)
Psychological Bulletin, vol. 62, Jul. 1964, p. 1-20. 62 refs.
Grant No. NIMH-G-MN06875-01, EP-7-R01.

The review analyzes the experiments on perceptual isolation with special reference to the phenomena of reported visual and auditory sensations. Variables analyzed include: methods of confinement and restriction, conditions of illumination, duration of isolation, set, instructions and suggestions, reporting or verbalization instructions, sleep, subject populations, prior knowledge and expectations, intelligence and personality characteristics of subjects, stress response, and methods of obtaining reported visual and auditory sensations. The relevance of some of the findings to physiological, psychoanalytic, cognitive, and social psychological theories of perceptual isolation are discussed. Variables which seem important in the phenomena discussed are set, verbalization instructions, subject's alertness, and experimenter's methods of obtaining responses.

A64-80898

SYNCOPE INDUCED BY THE VALSALVA MANEUVER: A STUDY OF THE EFFECTS OF ARTERIAL BLOOD GAS TENSIONS, GLUCOSE CONCENTRATION AND BLOOD PRESSURE.
L. J. Klein, Herbert A. Saltzman, Albert Heyman, and Herbert O. Sieker (Duke U. Med. Center, Dept. of Med.; and Veterans Admin. Hosp., Durham, N.C.)
American Journal of Medicine, vol. 37, Aug. 1964, p. 263-268. 19 refs.
Grants No. NIH-G-B-669; NIH-G-A1596; and NIH-G-2E31.

Various physiologic factors influencing syncope induced by combined Valsalva maneuver and hyperventilation were studied in volunteer subjects. Syncope almost always occurred at a critical level of mean arterial pressure of 51 mm. Hg and arterial blood carbon dioxide tension of 26 mm. Hg. Although a marked reduction in blood pressure alone occasionally resulted in loss of consciousness, a combination of hypotension and hypocapnia was usually necessary for syncope to occur. The inhalation of 100% oxygen or the intravenous administration of 50% glucose failed to prevent or delay the onset of syncope, but occasionally the concomitant electroencephalographic abnormalities were diminished by hyperglycemia. These studies indicate that the reduction in cerebral blood flow associated with hyperventilation is an important predisposing factor in syncope, particularly when associated with a transient decrease in effective blood pressure.

A64-80899

SEASONAL VARIATION OF ADRENAL CORTEX ACTIVITY.
Gen-ichi Watanabe (U. of Niigata School of Med., Dept. of Hyg., Japan).
Archives of Environmental Health, vol. 9, Aug. 1964, p. 192-200. 19 refs.

Circulating eosinophil and lymphocyte counts, 24-hour urinary outputs of neutral 17-ketosteroids (17-KS) and of 17-hydroxycorticosteroids (17-OHCS), and amounts of free 17-OHCS in peripheral blood were determined monthly for more than ten healthy male and female adults for more than a year. Parameters showing adrenal cortical activity in blood all showed diphasic seasonal curves, suggesting increased activity in severe climates, either hot or cold, and, conversely, decreased activity in intermediate, mild seasons. While seasonal curves of urinary outputs of 17-KS and 17-OHCS were monophasic in appearance, the highest levels occurring during winter, analyses of the relationship between atmospheric temperatures at noon and urinary outputs implied diphasic seasonal changes without exception so that outputs were increased not only at lower but also at higher ambient temperatures. From these findings, it seems that the adrenal cortex is most active during winter and is also active in hot weather but functions less in intermediate seasons in temperate zones.

A64-80900

AN ASSESSMENT OF THE FRACTIONAL CARBON MONOXIDE UPTAKE AND ITS RELATIONSHIP TO PULMONARY DIFFUSING CAPACITY.
C. R. Woolf (Toronto U., Toronto Gen. Hosp., Dept. of Med., Cardio-Respirat. Lab., Canada).

Diseases of the Chest, vol. 46, Aug. 1964, p. 181-189. 6 refs.
Ontario Heart Found.; and Grants No. NH-G-CR-35; and MRC-G-MA-680.

The fractional carbon monoxide uptake in lungs ($F_{\text{U}_{\text{CO}}}$) and pulmonary diffusing capacity (D_{CO}) were measured in 48 normal subjects (men and women from ages 16 to 53) and in 64 chronic chest disease patients at rest and during exercise. The $F_{\text{U}_{\text{CO}}}$ had a narrower range than D_{CO} , was little affected by voluntary hyperventilation, and showed no significant differences between sexes and no relationship to body surface area; but a decrease was present at rest with increasing age. The $F_{\text{U}_{\text{CO}}}$ revealed abnormalities of gas exchange not shown by D_{CO} . A modification of the Bates steady-state technique for estimating diffusing capacity is described.

A64-80901

AUTOINHIBITOR PRODUCTION BY CHLORELLA VULGARIS.
J. E. Scutt (A. Guinness Ltd., London, England).

American Journal of Botany, vol. 51, Jul. 1964, p. 581-584. 8 refs.
Filtrates from certain liquid cultures of Chlorella vulgaris (Columbian strain) developed sufficient peroxide content, after a few days' storage, to inhibit further growth of Chlorella when they were used to prepare fresh culture media. Similar inhibition was observed when Chlorella was cultured in media containing various added organic peroxides. Growth of Chlorella was not limited by autoinhibitor production under the conditions employed, and no peroxide or other inhibitor was detected in solvent extracts of the cells or fresh filtrates.

A64-80902

THE POSITIVE SKEW OBSERVED IN REACTION TIME DISTRIBUTIONS.
P. D. McCormack and Nancy M. Wright (Manitoba U., Winnipeg, Canada).
Canadian Journal of Psychology, vol. 18, Mar. 1964, p. 43-51. 10 refs.
Grant No. CNRC-G-APA-78.

Five right-handed males performed a simple reaction time task while electromyographic recordings were made from the forearm flexors. Three types of muscle response were observed during the task. Anticipatory responding was not primarily responsible for the long latencies observed. B-type of response was found to be associated with long latencies. Ancillary experiments performed confirmed the association between B-type response and longer than average latencies. The results are discussed in terms of approach-avoidance gradients.

A64-80903

UNDERNUTRITION AND TEMPERATURE REGULATION IN ADULT RATS.
T. Helm and J. Mestyan (Med. U., Dept. of Paediat., Pecs, Hungary).
Acta physiologica Academiae scientiarum hungaricae, vol. 24, 1964, p. 299-304. 15 refs.

In the course of undernutrition of adult rats, a rapid initial and subsequent slow decline in basal O_2 consumption was observed. Colonic temperature did not change appreciably at the neutral thermal environment. The metabolic response to hyperthermia decreased roughly parallel to the basal metabolic rate with the progress of undernutrition. In the early phase of starvation the metabolic response to 20°C was less than in the control period. With growing loss of weight, in association with an increasing fall in colonic temperature, the increase in heat production was relatively great. Exposure to 5° to 10°C caused a considerable increase in heat production and body temperature was maintained or even increased. It is concluded that the regulated level of body temperature is reset in severe undernutrition.

A64-80904

RECOVERY FROM DECREMENT AS A FUNCTION OF SUCCESSIVE ALTERATIONS OF WORK AND REST PERIODS.
Edward A. Bilodeau (Tulane U., New Orleans, La.)
Psychonomic Science, vol. 1, Aug. 1964, p. 205-206.

A total of 192 airmen in three groups performed a two-hand coordination tracking task with four different target courses. The three groups differed only in terms of the duration of rest interpolated between 15 successive four-minute trials. The results confirm that the classical concept of recovery as an increasing, negatively accelerated function of rest duration characterizes $Rest_1$ and cannot be generalized to $Rest_2$ successfully.

A64-80905

CONTROL OF EYE FIXATION BY AUDITORY FEEDBACK.

William M. Smith (Dartmouth Coll., Hanover, N.H.)

Psychonomic Science, vol. 1, Aug. 1964, p. 233-234.

Grant No. NSF-G-GE-1110.

Two subjects maintained eye fixation under four different experimental conditions with and without auditory feedback. All observations were made with the left eye. The results indicate that auditory information can be utilized in controlling eye fixation, particularly as normal visual control of fixation is decreased. The retinal component of the normal visual feedback loop is not a necessary condition for maintaining eye position.

A64-80906

DRUG EFFECTS UPON VISUAL SIGNAL-FROM-NOISE DETECTION BY MONKEYS.

V. J. Polidora and Ronald J. Urbanek (Wis. U., Wis. Regional Primate Res. Center, Madison).

Psychonomic Science, vol. 1, Aug. 1964, p. 237-238.

Grant No. NIH-G-FR-0167; U.S. Army Chem. R and D Labs.

Three adult male rhesus monkeys were conditioned on a discrete trial avoidance task involving visual signal-from-noise detection. After training to a criterion, chlorpromazine hydrochloride and pentobarbital sodium were injected intramuscularly. The results show monkeys' performance on a visual signal-from-noise detection task to be a moderately sensitive behavioral assay of drug effects, which is more specific to the effects of chlorpromazine than to those of pentobarbital. Magnitude of the effect of the former was inversely related to the detectability of the visual signal.

A64-80907

SUN COMPASS ORIENTATION OF PIGEONS UPON DISPLACEMENT NORTH OF THE ARCTIC CIRCLE.

Klaus Schmidt-Koenig (Duke U., Dept. of Zool., Durham, N.C.; and Max-Planck-inst. für Verhaltensphysiol., Seewiesen, Germany).

Biological Bulletin, vol. 127, Aug. 1964, p. 154-158. 10 refs.

Three homing pigeons, directionally trained in a semiautomatically operating apparatus at Durham, N.C. ($36^{\circ}00'N$; $78^{\circ}56'W$), were displaced to Barrow, Alaska ($71^{\circ}10'N$; $150^{\circ}41'W$), around the summer solstice of 1962. At "night" the birds allowed dichotomously for a clockwise and a counterclockwise movement of the sun. This is the first indication that individuals may follow the "bee pattern" as well as the "Talitrus pattern."

A64-80908

HIGH OXYGEN PRESSURE AND THE RETINAL BLOOD-VESSELS.

C. T. Dollery, D. W. Hill, C. M. Mailer, and P. Sousa Ramalho (Postgraduate Med. School, London, England).

Lancet, vol. 2, Aug. 8, 1964, p. 291-292. 9 refs.

Med. Res. Council-supported research.

Four photographs of the optic-disc area of the retina and four of the superior temporal quadrant were taken on Kodachrome III film while the subject breathed air at 1 atm., and again after breathing oxygen through a respiratory valve box at 1 atm. for five minutes. The subject then breathed oxygen at 1 1/2 or 2 atm., or air at 5 atm., and after five minutes the same standard views were photographed. On two occasions the tension of the opposite eye was measured with a Schiotz tonometer while breathing oxygen at 2 atm., and on two other occasions post-dead-space alveolar gas samples were collected after breathing air at 5 atm. The vessels were divided into groups according to their initial size and the mean percentage change for each group was calculated. Results in two subjects with 1 1/2 atm. oxygen gave intermediate values between the 1 and 2 atm. figures. In two subjects there was no significant difference between the degree of constriction observed with oxygen at 1 atm. and air at 5 atm. No detectable change occurred in the intraocular tension while breathing oxygen at 2 atm. pressure or in the alveolar carbon dioxide tension while breathing air at 5 atm.

A64-80909

ANTIRADIATION COMPOUNDS V. α -AMINO ACID ESTERS OF 2-MERCAPTOETHYLAMINE.

William O. Foye and Robert H. Zaim (Mass. Coll. of Pharm., Boston).

Journal of Pharmaceutical Sciences, vol. 53, Aug. 1964, p. 906-908. 19 refs.

Contract No. DA-49-193-MD-2029.

A series of S- α -amino acid esters of 2-mercaptoethylamine (MEA) were prepared in an attempt to obtain less toxic and longer acting derivatives of

MEA with radiation-protective properties. The method of preparation consisted of a dry fusion of the amino acid chloride hydrochloride with MEA hydrochloride. It was found that the thioesters liberate MEA on acid hydrolysis; hydrolysis constants have been determined.

A64-80910

LIPID METABOLISM IN THE HEART DURING FASTING.

Benjamin Wittels and Rubin Bressler (Duke U. Med. Center, Depts. of Pathol. and Med., Durham, N.C.)

Laboratory Investigation, vol. 13, Jul. 1964, p. 794-799. 28 refs.

Grants No. PHS-G-HE0778-01 and PHS-G-HE7061.

Lipid metabolism in the myocardium was studied in the fasting guinea pig. Two phases in the response of the heart to fasting were discerned. In the initial period, the triglyceride concentration in the myocardium increased markedly but the capacity of the myocardium to oxidize palmitic acid was not affected. With prolongation of the fast, the rate of palmitic acid oxidation by the heart increased significantly and the concentration of myocardial triglyceride fell. The changes in the triglyceride levels were paralleled by the myocardial content of stainable fat. It is postulated that during fasting, the concentration of myocardial triglyceride or its histologic counterpart, fat stainable with oil red O, is regulated by a balance between the rate of free fatty acid extraction from the plasma and the capacity of the myocardium to oxidize long-chain fatty acids. The metabolic basis of fatty degeneration of the myocardium as it occurs in fasting is compared with that related to diphtheria toxin.

A64-80911

CERTAIN CONCLUSIONS AND PERSPECTIVES OF THE DEVELOPMENT OF RADIOBIOLOGICAL INVESTIGATIONS IN SPACE [NEKOTORYE ITOGI I PERSPEKTIVY RAZVITIYA RADIOBIOLOGICHESKIKH ISSLEDOVANIY V KOSMOSE].

N. M. Sisakian, V. V. Parin, V. V. Antipov, N. N. Dobrov, and P. P. Saksonov. *Izvestiya Akademii nauk SSSR*, no. 3, May-Jun. 1964, p. 341-351.

24 refs. In Russian.

Venturing into space, man and other living organisms which may accompany him will be subjected to severe exposure to cosmic radiation. The problems of establishing biological tolerance and modes of protection from exposure during flight require special attention. Space radiation consists of (1) primary cosmic rays of galactic origin; (2) protons formed by solar flares; and (3) ionizing radiation from the Van Allen belts. The proposed nuclear propulsion systems of the spacecraft themselves may be a source of radiation due to accidental failure. Valuable information has been gained from the data obtained during Soviet and American orbital flights. Small animals, microorganisms, and tissue cultures were included in these missions. The results indicate certain deviations from normal in organic functions and in heredity. However, full conclusions will be reached only after further extensive studies.

A64-80912

EFFECTS OF EXTRATERRESTRIAL RADIATION: BIOLOGICAL STUDIES [EFFETS DES RAYONNEMENTS EXTRA-TERRESTRES ETUDES BIOLOGIQUES].

R. P. Delahaye and E. Tabusse.

Forces Aeriennes Francaises, no. 206, Aug.-Sep. 1964, p. 303-314.

In French.

A review is presented of previously published articles on the effects of ionizing and particulate radiation on biological material ranging from *Chlorella* to man on earth, below ground, and in aircraft, balloons, and satellites.

A64-80913

INTRODUCTION OF RATS AND MICE VIA AIRPLANES TO THE AIRPORTS OF USSR AND THE POSSIBILITY OF THEIR CONTACT WITH THE LOCAL RODENT POPULATION [ZAVOZ SAMOLETAMI V AEROPORTY SSSR KRYIS I MYSHEI I VOZMOZHNOST' IKH KONTAKTA S MESTNOI POPULIATSIIEI GRYZUNOVI].

V. B. Sil'verstov and M. R. Netsengevich (USSR, Min. of Public Health, Central Anti-Plague Observation Sta., Moscow).

Zoologicheskii zhurnal, vol. 43, 1964, p. 1056-1061. 9 refs. In Russian.

The recent expansion of air travel created a problem of controlling accidental transport of rodents, which usually carry ectoparasites, the potential carriers of microorganisms causing diseases such as plague. An inspection of the six Moscow airports, including the two serving international lines, disclosed that, in the period of 1956-1962, 6234 rodents and insectivora of 13 species were trapped. Over half of this number were house mice and rats while the rest were field mice and shrews. In all, 13 species were recorded. The animals carried 13 species of fleas, which were transmitted through contact from wild to domestic rodents. The following measures are recommended: (1) extermination of rodents and arthropods by means of mechanical traps and flypaper on incoming aircraft, particularly from countries or Soviet regions known as plague foci; (2) regular check of the airport premises, including all buildings and open structures, for rodent populations; and (3) construction of rodentproof buildings.

A64-80914**EFFECTS OF DECELERATION ON RATS EXPOSED TO PROLONGED CENTRIFUGATION.**

J. Oyama and W. T. Platt (NASA, Ames Res. Center, Moffett Field, Calif.)
Nature, vol. 203, Aug. 15, 1964, p. 766-767.

Studies of the effects of both an increase and a decrease in gravity on rats adapted to relatively high g by prolonged centrifugation are presented. Sprague Dawley rats were placed on a 10-radial-armed centrifuge and subjected to either 2.5, 3.5, or 4.7 g, depending upon the radius used. Rats adapted to 2.5 g for 164 days and then subjected to 3.5 g and 4.7 g show a marked decrease in body weight and food and water consumption. In distinct contrast, rats adapted to 3.5 g for 164 days when decelerated to 2.5 g show no such changes. The results indicate that deceleration is well tolerated by rats and appears not to be a stress factor, whereas any sustained incremental increase in gravity has a deleterious effect on appetite and body-weight maintenance.

A64-80915**FALLING EFFICIENCY AT SORTING CARDS DURING ACCLIMATIZATION AT 19,000 FT.**

M. B. Gill, E. C. Poulton, A. Carpenter, M. M. Woodhead, and M. H. P. Gregory (Auckland Hosp., New Zealand; and MRC, Appl. Psychol. Res. Unit, Cambridge, Gr. Britian).
Nature, Vol. 203, Jul. 25, 1964, p. 436. 7 refs.

During the Himalayan Scientific and Mountaineering Expedition, 1960 through 1961, the members sorted cards three times: once a practice run at a height not much above sea level, and then two tests at 19,000 feet. Before the first test the average stay at 19,000 feet had been 2 weeks, with an additional 6 weeks at 15,000 feet. Between the two tests an additional average of 9 weeks had been spent at 19,000 feet, plus 2 weeks at 15,000 feet. Adequate data were available for only three members of the expedition, whose ages ranged from 23 to 32 years. A comparable group of 11 research scientists was used who sorted cards with the same card sorter three times at Cambridge, separated by the same average time intervals. Results showed that the number of delayed responses increased after acclimatization at 19,000 feet, whereas it fell slightly at above sea level. That the change was for the worse is compatible with the observation that all members of the party lost weight at a rate of 1 to 3 pounds per week at 19,000 feet.

A64-80916**BLOOD VELOCITY TELEMETERED FROM UNTETHERED ANIMALS.**

Dean L. Franklin (Scripps Clin. and Res. Found., Inst. for Cardio-Pulmonary Diseases; and Scripps Inst. of Oceanog., La Jolla, Calif.), Nolan W. Watson, and Robert L. Van Citters (Wash. U., Dept. of Physiol. and Biophys., Seattle).
Nature, vol. 203, Aug. 1, 1964, p. 528-530.
 Grants No. PHS-G-HE-08337; PHS-G-HE-8433; and PHS-G-HE-08323.

A system for telemetry of blood flow data from major vessels of healthy, active, totally unrestrained animals (e.g., dogs, baboons, elephant seals) is presented. The simplicity and low-power consumption of the system are compatible with the small packaging requirements of telemetry from small animals. Drift in sensitivity is proportional to drift in the crystal excitation frequency, which can be held constant, and to variations in the velocity of sound in blood which have been found to be negligible. The flow information from the 5-Mc/s receiver amplifier is in the form of a frequency modulated, audio-frequency signal, which allows the use of standard FM/FM telemetry techniques without the necessity of including a separate subcarrier oscillator.

A64-80917**THE ORIGIN OF LIFE IN SPACE.**

A. I. Oparin (USSR Acad. of Sci., Inst. of Biochem., Moscow).
Space Science Reviews, vol. 3, Jul. 1964, p. 5-26. 53 refs.

The origin of life can be attributed to the evolution of carbon compounds. On earth three stages can be traced. First, formation of simple organic compounds, such as hydrocarbons and cyanides and their oxygen, nitrogen, sulfur, phosphorus, and other derivatives of low molecular weight. Second, polymerization and condensation of these compounds in "the primordial soup". Third, formation of multimolecular complexes, the precursors of the simplest organisms which later developed into all types of terrestrial life. The first step is universal. It takes place even on those extraterrestrial bodies that are essentially different from earth. The second step is very possible on those celestial bodies that are close to earth. This is indicated by the presence of organic polymers (carbonaceous chondrites) in the meteorites, and by seasonal periodicity of spots on Mars. However, the process of their formation may be different from that on earth. The final stage of formation of complex living organisms in space seems possible, but is still debatable.

A64-80918**FIELD EVALUATION OF FULL PRESSURE SUITS IN ARCTIC ENVIRONMENTS.**

James H. Veghte (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 35, Sep. 1964, p. 819-823.

Thermal responses of six subjects wearing full pressure suits were monitored for several days under Arctic field conditions. In laboratory experiments, heat loss from clothed subjects was measured with an infrared radiometer, and moisture accumulation within the clothing determined during exercise. In temperatures of -16°F ., five of the six subjects with no survival equipment reached tolerance limits (skin temperature of 35°F .) before 15 hours had elapsed. Termination of the experiment was always because of foot temperatures. Heat loss for these subjects varied from 0.6 to 20.6 kcal./m.² hr. With survival equipment, subjects tolerated ambient temperatures that varied from -24° to 25°F for 72 hours. Radiometric thermograms of the pressure garments indicated gloves, zippers, and face were high heat loss areas. Over 600 g. of sweat were retained in closed pressure suits during mild exercise at -10°F . When the suit was partially opened, there was a significant reduction of this retained moisture. These data show the critical need for extremity protection, shelter, and ventilation of the pressure garments in dry cold environments.

A64-80919**HEARING SENSATIONS IN ELECTRIC FIELDS.**

H. C. Sommer and H. E. von Gierke (Aerospace Med. Res. Labs., Biodyn. and Bionics Div., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 35, Sep. 1964, p. 834-839. 20 refs.

Electrophonic hearing, stimulated by an audiofrequency current passed through different types of electrode systems attached to various areas of the head and body, has been previously investigated. More recently, human auditory system response to modulated electromagnetic energy has been reported. The experiments to be discussed in this paper were designed to study the hearing phenomena in electrostatic fields when the whole head or parts of its surface are exposed to an alternating electrostatic field of audiofrequency with and without a superimposed d.c. field. The threshold data obtained suggest there is no other auditory stimulation excepting mechanical tissue excitation by the electrostatic forces connected with such fields. Calculated threshold data for stimulation by amplitude modulated RF fields, assuming the same electromechanical excitation of normal bone and air conduction hearing, are presented and compared to the hearing phenomena in such fields reported by others.

A64-80920**OXYGEN TOXICITY AND VITAMIN E.**

Herbert E. Kann, Jr., Charles E. Mengel, Wirt Smith, and Betty Horton (Duke U. Med. Center, Dept. of Med., Durham, N.C.).
Aerospace Medicine, vol. 35, Sep. 1964, p. 840-844. 25 refs.
 Grant No. PHS-G-CRTY-5042.

Vitamin E has been shown to prevent hemolytic anemia and to decrease the incidence of convulsions and mortality in mice exposed to oxygen at high pressure (OHP). Vitamin E has also been demonstrated to decrease lysis and lipid peroxide formation in erythrocytes incubated in vitro with agents known to promote lipid peroxidation. The only known biochemical effect of Vitamin E is inhibition of lipid peroxidation. These findings have supported the hypothesis that excessive lipid peroxidation is responsible for hemolytic anemia and convulsions in mice exposed to OHP.

A64-80921**THE EFFECTS OF CORIOLIS ACCELERATION DURING ZERO-GRAVITY PARABOLIC FLIGHT.**

James K. Colehour (US Naval School of Aviation Med., Pensacola, Fla.).
Aerospace Medicine, vol. 35, Sep. 1964, p. 844-848. 22 refs.
 NASA-supported res.

Twenty-one normal and four labyrinthine defective (L-D) subjects were exposed to repetitive, twenty-second intervals of zero gravity or zero gravity plus Coriolis acceleration in parabolic flight. The normal subjects showed significant hematological and biochemical evidence of stress in the form of leukocytic changes and alteration in excretion rates of corticosteroids, while the L-D group were virtually free of such changes. Catecholamine excretions were not significantly altered in either group under each of the test conditions. The zero gravity flight of this experiment did not produce significant change in the muscle metabolism parameters, lactic and pyruvic acids and lactic dehydrogenase.

A64-80922**ADRENAL FUNCTION DURING BED REST.**

Fred H. Katz (USAF School of Aerospace Med., Aerospace Med. Div., Brooks AFB, Tex.).
Aerospace Medicine, vol. 35, Sep. 1964, p. 849-851. 12 refs.

Plasma 17-hydroxycorticosteroid levels as adrenal secretory rates of aldosterone and cortisol were measured in healthy subjects before and during periods of bed rest. The circadian rhythm of plasma 17-hydroxycorticosteroid was well maintained during bed rest. There was no change in adrenal cortisol secretion rates during bed rest. Aldosterone secretory rate did not change with bed rest; however, following a period out of bed, there was a diminution of aldosterone secretory rate during a subsequent bed rest period. Inactivity from bed rest therefore does not appear to change adrenal cortisol production. Conclusions cannot be drawn as yet concerning aldosterone production.

A64-80923**PHYSICAL DEFECTS OF CIVILIAN PILOTS RELATED TO AIRCRAFT ACCIDENTS.**

Charles R. Harper (United Airlines Training Center, Stapleton Field, Denver, Colo.)

Aerospace Medicine, vol. 35, Sep. 1964, p. 851-856. 14 refs.

The frequency of existing pathological defects and history of defects in a sample of 3,182 pilots involved in general aviation accidents during 1963 are compared to the observed frequency of these same defects in the total pilot population. The comparisons are largely pathology groups, e.g., eye, cardiovascular, orthopedic defects, etc. However, specific comparisons are made concerning defective distant visual acuity, contact lens wearers, and age. Fatality rates are evaluated for pilots with multiple pathologies. The overall frequency of pathology found in pilots involved in accidents is a significant 2.7 times greater than that frequency in the overall pilot population. Significantly greater frequencies are also found for every pathology group in the accident sample except pilots with corrected defective distant visual acuity whether corrected by spectacles or contact lenses; these pilots are represented less in the accident sample than in the total pilot population. As a pilot ages, he is represented significantly more in the accident sample. As age and pathology per pilot increase, the fatality rate increases.

A64-80924**THE IMPORTANCE OF THE OTOLITHS IN DISORIENTATION.**

W. H. Johnson (Defence Res. Med. Labs., Toronto, Canada).

Aerospace Medicine, vol. 35, Sep. 1964, p. 874-877. 12 refs.

Other than the oculogravic illusion, little is known of the effects of stimulating the otoliths. It is possible, even probable, that the stimulation of these organs, particularly during and subsequent to weightlessness and during changes in linear acceleration, could produce effects of importance in flight. The lack of knowledge results mainly from the difficulty in the laboratory of stimulating the otoliths without at the same time stimulating the semicircular canals; there is also a scarcity of objective signs of otolithic stimulation. A new laboratory procedure is described in which human subjects are exposed to "orbiting without rotation", i.e., to a linear acceleration that is continuously changing direction clockwise or counterclockwise. Evidence is presented which suggests that this is an otolithic stimulus causing measurable effects.

A64-80925**FLASHBLINDNESS: A PROBLEM OF ADAPTATION.**

J. H. Hill and Gloria T. Chisum (US Naval Air Develop. Center, Aviation Med. Acceleration Lab., Johnsville, Pa.)

Aerospace Medicine, vol. 35, Sep. 1964, p. 877-879. 10 refs.

Flashblindness, the temporary reduction in visual sensitivity due to exposure to a high intensity flash, is a potential problem to pilots of modern high performance aircraft. Some of the possible solutions to this problem are presented and evaluated in this paper. A brief description of the visual processes affected is given. The relation of light adaptation and dark adaptation of the eye to the changing lighting conditions and the recovery of sensitivity to a functional level are discussed. The suitability of fixed density goggles as a protective system is examined, and the results of the simulation of protective devices with closing time of 33 microseconds, 165 microseconds, and 9.8 milliseconds are reviewed. Eye patch studies are also discussed.

A64-80926**RESPONSES TO ADRENALINE AND NORADRENALINE IN CATS DURING HYPOXIA, HYPERVENTILATION AND HYPEROXIA.**

C. W. Gowdey and Y. J. Patel (U. of Western Ontario, Dept. of Pharmacol., Med. School, London, Ontario, Canada).

Archives Internationales de Pharmacodynamie et de Thérapie, vol. 150, Jul. 1964, p. 67-84. 46 refs.

Defence Res. Board of Canada supported res.

The pressor responses to intravenous injections of adrenaline and noradrenaline were significantly reduced in spinal cats during hypoventilation-induced hypoxia and acidosis. Similar reductions were found in anesthetized cats made hypoxic by decompression to a simulated altitude of 20,000 feet. Hyperventilation-induced hypocapnia and alkalosis also reduced the pressor responses to injected catecholamines in spinal cats. When hypocapnia was prevented by hyperventilating with 5% CO₂, the pressor responses were not markedly different from those during optimal ventilation. Hyperoxia did not modify the pressor responses to injected adrenaline or noradrenaline. An increased resistance of the femoral arterial bed was observed during both hypo- and hyperventilation. Intravenous injections of either catecholamine during these ventilatory changes tended to decrease the already elevated peripheral resistance, but even so, the resistance remained above that during optimal ventilation. The contractions of the nictitating membrane evoked by adrenaline were larger during hyperventilation and smaller during hypoventilation than those during optimal ventilation. Explanations for these findings are attempted.

A64-80927**EFFECTS OF HYPOXIA ON THE RABBIT DURING EXPOSURE TO COLD.**

Bryan Broom (Middlesex Hosp. Med. School, Dept. of Physiol., Gt. Britain).

Nature, vol. 203, Aug. 1, 1964, p. 498-499. 34 refs.

Experiments are presented studying effects of hypoxia, with and without concomitant hypercapnia and/or anesthesia, on body temperature and survival time of rabbits in a known and limited supply of oxygen, both at neutral (14° to 18° C.) and reduced (-18° to -24° C.) ambient temperatures. It was observed that hypoxia markedly reduces the body temperature in the cold, but only moderately at neutral ambient temperatures. However, the cooling rates in hypoxia are half those found with normoxia; the carbon-dioxide-induced acceleration of hypothermia is abolished and the pentobarbitone-induced acceleration of hypothermia is nearly halved. In contrast to normoxia, prolongation of survival time is replaced by a diminution of survival time by carbon-dioxide inhalation as compared with pentobarbitone anesthesia. The increase of oxygen uptake by carbon dioxide that is seen in hypoxia is insufficient to maximize cooling rates, and under the hypoxic stimulus only the decrease of oxygen consumption by pentobarbitone operates to increase cooling, a function that is curtailed in these circumstances. These facts substantiate the view that carbon dioxide operates by enhancing oxygen uptake, with which both survival time and cooling rate may be maximal, in normoxia. The results also demonstrate the protection conferred by prior anesthesia and hypothermia against hypoxia.

A64-80928**EFFECT OF OXYGEN ENRICHED ATMOSPHERES ON THE BURNING RATE OF FABRICS.**

Maria A. Chianta and Alice M. Stoll (US Naval Air Develop. Center, Aviation Med. Acceleration Lab., Johnsville, Pa.)

Aerospace Medicine, vol. 35, Sep. 1964, p. 870-873. 6 refs.

Investigation of the possibility of oxygen enrichment of space-capsule atmospheres without increasing clothing fire hazard has revealed that, under certain conditions maintained in experiments with the best fire-resistant clothing material available, only a 10% increase in oxygen concentration may be realized in an oxygen-nitrogen atmosphere irrespective of pressure. Similarly, a 20% increase is possible, if argon is used. The results of the experiments also demonstrated existence and progression of the damping effect of inert gases, and suggested a means of extending observations made in one gaseous environment to any other of known physical properties. It is concluded that significant oxygen enrichment may be achieved safely only by introduction of a physiologically safe gas or gas mixture at least twice as dense as nitrogen.

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